
CAS 740 Vital Signs Monitor



Service Manual

THE CAS 740 VITAL SIGNS MONITOR

FEATURES

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|--------------------|--|
| CAS 740 - 1 | Non-Invasive Blood Pressure and Pulse Rate. |
| CAS 740 - 2 | Non-Invasive Blood Pressure, Pulse Rate and Pulse Oximeter.
or
Non-Invasive Blood Pressure, Pulse Rate and Temperature. |
| CAS 740 - 3 | Vital Signs Monitor with Non-Invasive Blood Pressure, Pulse Rate, Pulse Oximeter and Predictive Temperature. |

IMPORTANT:

This manual addresses all parameters of the CAS 740 Vital Signs Monitor. You may have purchased a model that does not have all the parameters referred to in the manual.

THIS MANUAL REMAINS SUITABLE FOR USE!

HOW TO CONTACT US

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1. INTRODUCTION AND INTENDED USE

INTRODUCTION

The CAS 740 Monitor is multi parameter monitor measuring blood pressure, oxygen saturation and temperature. Non-invasive blood pressure is measured using the oscillometric technique determining systolic, diastolic, mean arterial pressure and pulse rate. The pulse oximeter function continuously monitors and displays values for functional arterial hemoglobin saturation and a pulse rate. Temperature is obtained in the normal (predictive) mode in as little as four (4) seconds. A monitoring mode is available for taking axillary temperatures.

INDICATIONS FOR USE

The CAS 740 Monitor is a portable device intended to be used by trained clinicians for multi-parameter vital signs monitoring of neonatal, pediatric and adult patients in health care bedside applications as well as for intra-facility or inter-facility and EMS transport. Parameters displayed are the non-invasive blood pressure (systolic, diastolic and mean arterial pressure), pulse rate, functional oxygen saturation of arterial hemoglobin (%SpO₂) and temperature.

CONTRAINDICATIONS

Oral and Rectal Temperature measurements are not intended for neonatal use. Reusable SpO₂ sensor is contraindicated for use for prolonged periods of use. It is not intended for long term monitoring. It must be removed and repositioned every four (4) hours and if indicated by circulatory condition or skin integrity, reapplied to a different monitoring site. Disposable SpO₂ sensors are contraindicated for patients that exhibit allergic reactions to adhesive tape. The sensors must be removed and repositioned every eight (8) hours and if indicated by circulatory condition or skin integrity, reapplied to a different monitoring site. No other contraindications are known at this time.

BRIEF DEVICE DESCRIPTION

The CAS 740 Monitor is compact, lightweight and portable, allowing it to be easily carried and used in a variety of clinical settings. The monitor is powered by AC Line Power, +12 VDC or by a Nickel Metal Hydride (NiMH) rechargeable battery pack. The internal battery pack charges when the monitor is plugged into a power source (AC Line Power or +12 VDC). The CAS 740 Monitor can be set to operate in one of eight (8) different languages: English, German, French, Italian, Spanish, Dutch, Swedish or Portuguese. The message window can display various system alarm messages. These messages direct the user to check conditions such as the battery state, air leaks and measurement problems. The message window also displays the operational mode of the monitor (automatic or manual).

The non-invasive blood pressure (NIBP) parameter automatically inflates an occluding cuff and, using the oscillometric measurement technique, determines systolic, diastolic and mean arterial pressure and pulse rate. Measurement results along with operator prompts and error messages are displayed on the front panel. The frequency of NIBP determination can be selected by the operator in varied times between one and ninety minutes. The auto and manual operating modes cover a variety of clinical uses.

The pulse oximeter parameter (%SpO₂) determines arterial oxyhemoglobin saturation by measuring the absorption of red and infrared light passing through the tissue. Changes in absorption caused by pulsations of blood in the vascular bed are used to determine arterial saturation and pulse rate. The oximeter requires no routine calibration or maintenance. Oxygen saturation and heart rate are displayed on light emitting diode (LED) digital displays. On each detected pulse, the perfusion LED does indicate patient perfusion signals. This bar graph gives the user a pulse-by-pulse visual indication of waveform signal quality. An audio "beep" can be enabled that is generated each time the SpO₂ sensor detects a pulse.

NOTE:

The bar graph is not proportional to the pulse volume.

The temperature parameter has the capability of taking temperature in either normal (predictive) or monitor mode. In the normal mode, the thermometer's microprocessor "predicts" body temperature in about four (4) seconds for oral temperatures, about ten (10) seconds for axillary temperatures and in about fifteen (15) seconds for rectal temperatures.

Monitor mode is normally used for longer term monitoring and when difficult situations prevent accurate temperature from being taken in the predictive mode. In monitoring mode, the probe must be in contact with tissue for at least three (3) minutes for accurate oral / rectal temperature measurement and five (5) minutes for accurate axillary temperature measurement.

The default setting used by the CAS 740 Monitor for temperature determinations is the normal (predictive) mode.

NOTE:

Axillary temperature readings may only be taken in the Neonate monitoring mode.

PATIENT ENVIRONMENT

The CAS 740 Monitor has been tested with specific parts of the "system" used within the Patient Environment. Figure 1, defines the Patient Environment.

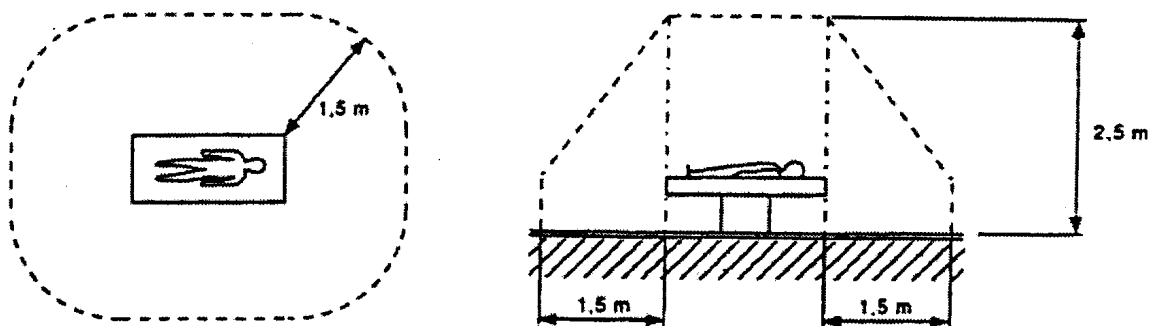


Figure 1: Patient Environment

The parts of the CAS 740 Monitor “system” that can be used in the Patient Environment are defined as;

The CAS 740 Monitor
Appropriate Accessories, listed in the ACCESSORIES section of the User’s Manual
Line Cord
Optional RS232 / Nurse Call Option
Citizen CMP-10 Mobile Printer
RS232 Interconnect Cable (supplied with printer)
AC Adapter / Charger, Model TRC-09-1100-M from Group West or equivalent (supplied with printer)

Table 1: Parts of the System

MANUAL OVERVIEW

This manual contains information for diagnosing and servicing the CAS 740 Monitor to board level without the necessity of electrical schematics. Only qualified service personnel should service this product.

Only qualified service personnel should service this product. It is the user’s responsibility to ensure that the product is properly maintained and that the monitor is in safe and proper operating condition before being put into use.

Before servicing the CAS 740 Monitor, read the User’s Manual carefully.

CAS Medical Systems, Inc. believes the information herein is complete and accurate, but accepts no liability for errors, omissions, or misrepresentations.

CONVENTIONS

In this manual, “WARNING”, “CAUTION”, and “NOTE” mean the following:

WARNING: Directions that warn of conditions that put the patient, or caregiver, at risk.
--

CAUTION: Directions that help you avoid damaging your monitor or losing data.

NOTE: Directions that make it easier to use your monitor.

RELATED DOCUMENTS

To perform test and troubleshooting procedures, you must know how to operate the monitor. Refer to the CAS 740 Vital Signs Monitor User’s Manual.

MONITOR CONFIGURATIONS

CAS 740-1	MAXNIBP™, 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 740M-1	MAXNIBP™, 12VDC Power input with Battery, Mount included
CAS 740-2MS	MAXNIBP™ and Masimo SpO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 740M-2MS	MAXNIBP™ and Masimo SpO ₂ , 12VDC Power input with Battery, Mount included
CAS 740-2NL	MAXNIBP™ and Nellcor SpO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 740M-2NL	MAXNIBP™ and Nellcor SpO ₂ , 12VDC Power input with Battery, Mount included
CAS 740-2NN	MAXNIBP™ and Nonin SpO ₂ , 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 740M-2NN	MAXNIBP™ and Nonin SpO ₂ , 12VDC Power input with Battery, Mount included
CAS 740-2T	MAXNIBP™ and Temperature, 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 740M-2T	MAXNIBP™ and Temperature, 12VDC Power input with Battery, Mount included
CAS 740-3MS	MAXNIBP™, Masimo SpO ₂ , and Temperature, 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 740M-3MS	MAXNIBP™, Masimo SpO ₂ , and Temperature, 12VDC Power input with Battery, Mount included
CAS 740-3NL	MAXNIBP™, Nellcor SpO ₂ , and Temperature, 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 740M-3NL	MAXNIBP™, Nellcor SpO ₂ , and Temperature, 12VDC Power input with Battery, Mount included
CAS 740-3NN	MAXNIBP™, Nonin SpO ₂ , and Temperature, 100-240V, 50/60HZ, AC Power Supply and Battery
CAS 740M-3NN	MAXNIBP™, Nonin SpO ₂ , and Temperature, 12VDC Power input with Battery, Mount included

Table 2: Monitor Configurations

2. SERVICE POLICY

WARRANTY POLICY

MONITORS

CAS Medical Systems, Inc. warrants the monitor, when new, to be free from defects in material and workmanship and to perform in accordance with manufacturer's specifications for a period of two (2) years from the date of original purchase from CAS or its authorized distributors or agents except as noted below.

The same warranty conditions are made for a period of one (1) year with respect to printers and battery and ninety (90) days on non-disposable accessories and certain components consisting of reusable SpO₂ sensors, reusable temperature probes and other accessories provided by CAS as part of the original purchase. CAS warrants blood pressure cuffs and disposable or single-patient-use products for out-of-box failure only. Where the accessory is not a CAS manufactured product, the manufacturers own warranty conditions apply.

CAS reserves the right to perform warranty service operations in its own factory, at an authorized repair facility, or at the customers' site.

Our obligation under this warranty is limited to repairing or, at our option, replacing any defective parts or our equipment, without charge, if such defects occur in normal service and with prompt notification.

Damage to any part through misuse, neglect, or accident, or by affixing any accessories or attachments other than CAS, Masimo[®], Nellcor[®], Nonin[®], and Welch Allyn[®] manufactured accessories or attachments, is not covered by this warranty.

ACCESSORIES, BATTERIES, CUFFS, AND CERTAIN COMPONENTS

In all cases, policy applies from date of purchase from CAS or its authorized distributors or agents.

Accessories:	Ninety (90) Days - Masimo, Nellcor and Nonin Sensors, Welch Allyn Temperature Probes.
Batteries:	One (1) Year
Cuffs (all):	Out-of-box failure only.
External Printer:	One (1) Year
Other Accessories:	Out-of-box failure only.

THERE ARE NO WARRANTIES, WHICH EXTEND BEYOND THOSE EXPRESSLY DESCRIBED IN THIS AGREEMENT AND THE COMPANY MAKES NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

EXTENDED WARRANTY PROGRAM

CAS Medical Systems offers an Extended Warranty Program for the CAS 740 Monitor.

A one (1) year Extended Warranty, on the monitor, is available at either the time of purchase or within two (2) years of the purchase date.

Contact CAS Medical Systems' Customer Service Department for more information.

RETURNING THE MONITOR FOR REPAIR

Before returning a product for repair you must obtain authorization from CAS Medical Systems. An RGA (Return Goods Authorization) number will be given to you by our Service Department. Be sure to note this number on the outside of your shipping box. Returns without an RGA number will not be accepted for delivery.

NOTE:

Save the original shipping container and its inside packing material should the monitor need to be returned for service.

Refer to the section *How To Contact Us*, found in the front of this manual, for important telephone numbers, fax numbers and email addresses.

3. SAFETY MEASURES AND WARNINGS

WARNING:

DO NOT use this instrument for any purpose other than specified in this manual. Doing so will invalidate the monitor's warranty.

DO NOT connect more than one (1) patient to the monitor.

The position of subject, physiological condition, and other factors affect the readings. Blood pressure and pulse can fluctuate greatly between measurements; the monitor cannot alert the user to changes in vital signs occurring between measurement cycles.

The power supply, located inside the CAS 740 Monitor, must be protectively grounded. If the integrity of the protective earth conductor (ground) in the AC Line cord is in doubt, the CAS 740 Monitor must be operated from its internal electrical power source (battery) only.

DO NOT, under any circumstances, perform any testing or maintenance on the monitor or power cord while the unit is being used to monitor a patient. Unplug the power cord before cleaning or servicing the monitor. The operator should not perform any servicing except as specifically stated in this manual.

DO NOT touch part of non-medical electrical equipment in the patient environment after removal of covers, connectors etc... without the use of a tool which operate at voltages not exceeding 25 VAC or 60 VDC and the patient at the same time.

DO NOT use any accessory if you notice any sign of damage. Contact CAS Medical Systems for assistance.

Equipment not suitable for use in the presence of a FLAMMABLE ANESTHETIC MIXTURE with AIR or with OXYGEN or NITROUS OXIDE.

Equipment is not intended to be used in Oxygen Enriched Atmospheres.

DO NOT gas sterilize or autoclave the monitor.

DO NOT apply the blood pressure cuff on an extremity being used for an intravenous infusion.

DO NOT place liquids on top of the monitor. Do not immerse the monitor or power cord in water or any liquid. If unit is accidentally wetted it should be thoroughly dried. The rear cover can be removed by a qualified service technician to verify absence of water.

During use and testing, single-use disposable temperature probe covers will limit patient cross-contamination and ensure the safety of the patient, user and device. The use of any other probe covers or failure to use a probe cover may produce temperature errors and will invalidate the monitor's warranty.

A pulse oximeter should be considered an early warning device. As a trend toward patient deoxygenation is indicated, blood samples should be analyzed by a laboratory co-oximeter to completely understand the patient's condition.

WARNING:

Accurate oxygen saturation measurements cannot be obtained when the oximeter is not measuring the pulse properly. If the perfusion LED is erratic or the PULSE RATE display is erratic or inaccurate, first examine the patient for any sign of distress and only then re-examine sensor placement.

CAUTION:

As with any non-invasive oscillometric blood pressure monitor, the accuracy of the measurements obtained may be adversely affected by the presence of agents, which alter the patient's cardiovascular system.

DO NOT operate the monitor unless it has been properly calibrated. Inaccurate blood pressure readings may result. A calibration check is recommended once every year. A pneumatic check is recommended once every six (6) months.

DO NOT alter the monitor's air hose. CAS Medical Systems cannot ensure proper monitor performance if the tubing is altered. Modification of the air hose will void the warranty. Avoid compression or restriction of pressure tubes.

DO NOT use the monitor during an MRI scan. The monitor may affect the MRI image, and the MRI unit may affect the accuracy of blood pressure measurements.

The monitor does not operate effectively if a patient is having seizure activity or is connected to a heart/lung machine.

In shock conditions, the low amplitude of the blood pressure waveform may make it difficult for the monitor to accurately determine the systolic and diastolic pressures.

When a patient is experiencing arrhythmias during a measurement, the accuracy of the pulse determination may be affected or the time needed to complete a measurement may be extended. The monitor will not make a determination beyond 120 seconds.

If the cuff is applied on a limb being used for oxygen saturation monitoring %SpO2 results will be altered during each blood pressure measurement due to the occlusion of blood flow.

Inspect the monitor, air hose and sensors for any damage prior to operation. If any damage is noted, the monitor should not be used until it has been serviced. The monitor should be repaired only by personnel authorized to do so by CAS Medical Systems, Inc.

Use only CAS Medical Systems approved accessories and sensors to preserve the integrity, accuracy and the electromagnetic compatibility of the monitor.

Consult a physician for interpretation of blood pressure measurements.

The oximeter is factory calibrated to determine the percentage of arterial oxygen saturation of functional hemoglobin. Significant levels of dysfunctional hemoglobin such as carboxyhemoglobin or methemoglobin may affect the accuracy of the measurement.

Cardiogreen and other intravascular dyes, depending on the concentration, may affect the accuracy of the oximeter measurement.

CAUTION:

Some sensors may not be appropriate for a particular patient. If at least ten seconds of one bar pulses cannot be observed for a given sensor, change sensor location or sensor type until this condition is achieved.

If the monitor fails to respond, DO NOT use it until the situation has been corrected by qualified personnel.

ACCIDENTAL SPILLS - In the event that fluids are accidentally spilled on the monitor, take the monitor out of operation and inspect for damage.

ELECTRICAL SHOCK - To reduce the risk of electrical shock, do not remove the back cover. Refer all servicing to qualified personnel.

ELECTROMAGNETIC COMPATIBILITY (EMC) - The equipment needs special precautions regarding EMC. Be aware that strong electromagnetic fields may interfere with monitor operation. Interference prevents the clear reception of signals by the monitor. If the hospital is close to a strong transmitter such as TV, AM, or FM radio, police or fire stations, a HAM radio operator, an airport, or cellular phone, their signals could be picked up as signals by the monitor. If you feel interference is affecting the monitor, contact your CAS Medical Systems representative to check the monitor in your environment.

ELECTROSURGERY - Measurements may be affected in the presence of strong electromagnetic sources such as electro surgery equipment.

GROUNDING - Do not defeat the three-wire grounding feature of the power cord by means of adaptors, plug modifications, or other methods. Do not use extension cords of any type. Do not connect the monitor to an electrical outlet controlled by a wall switch or dimmer.

INTERFACING OTHER EQUIPMENT - Monitoring equipment must be interfaced with other types of medical equipment by qualified biomedical engineering personnel. Be certain to consult manufacturers' specifications to maintain safe operation.

LEAKAGE CURRENT TEST - The interconnection of auxiliary equipment with this device may increase the total leakage current. When interfacing with other equipment, a test for leakage current must be performed by a qualified biomedical engineering personnel before using with patients. Serious injury or death could result if the leakage current exceeds applicable standards. The use of accessory equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system. Consideration relating to the choice shall include: use of the accessory in the patient vicinity; and evidence that the safety certification of the accessory has been performed in accordance with the appropriate IEC 601.1 and/or IEC 601.1.1 harmonized national standard.

STACKING - Where monitor is used adjacent to or stacked with other equipment, the monitor should be observed to verify normal operation in the configuration in which it will be used.

Read this manual carefully before patient use of the monitor.

GENERAL NOTES:

If the accuracy of any measurement does not seem reasonable, first check the patient's vital signs by alternate means and then check the CAS 740 Monitor for proper functioning.

The monitor is suitable for use in the presence of electro surgery.

The monitor is suitable to be connected to public AC mains power.

There are no known risks with common disposal of equipment or accessories; however, the disposing of accessories should follow in accordance with local hospital policies. The user should ensure these policies do not conflict with any local, state or federal guidelines.

The CAS 740 Monitor is not "Category AP or APG Equipment".

The CAS 740 Monitor is for "Continuous Operation".

The CAS 740 Monitor applied parts are "Type BF Defibrillation Proof".

The CAS 740 Monitor provides only "ordinary protection from ingress to moisture".

To completely remove AC Mains power from the CAS 740 Monitor, the power cord must be disconnected from the monitor.

AUTOMATIC SAFETY FEATURES

The monitor has been designed to promote patient safety. The maximum amount of time allowed to complete a blood pressure measurement is 120 seconds in adult mode and 90 seconds in neonate mode. If the measurement has not been completed within that time, the cuff is deflated automatically and a message is displayed indicating the problem.

To prevent exposure of the extremity to an inordinately high pressure, the cuff is deflated automatically when the pressure in the system is greater than 290 mmHg in the adult mode or 145 mmHg in the neonatal mode.

In the event of a microprocessor failure, the cuff will be deflated automatically within ten (10) seconds.

All equipment parts are protected against the effects of the discharge of a defibrillator. No separate actions are required when using this equipment with a defibrillator.

Should the AC or DC power be interrupted coming into the monitor, the monitor automatically runs off battery power. An indication of this would be a change in color of the Battery Power Visual Indicator LED from Green to either Orange or Red.

Whenever the power is disconnected from the monitor and the monitor is not allowed to shut down in an orderly fashion, the monitor, when re-powered alerts the user.

CAUTION:

Regardless of these safety features, always be sure to check that there are no signs of prolonged impairment of circulation and that the monitor is functioning properly.

4. DECLARATION OF CONFORMITY

Manufacturers Declaration of Conformity Electronic Emissions and Immunity

The CAS 740 Monitor is intended for use in the electromagnetic environment specified below. The customer or the user of the CAS 740 Monitor should assure it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment
RF emissions – CISPR 11	Group 1	The CAS 740 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions – CISPR 11	Class B	The CAS 740 is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class B	
Voltage fluctuations / flicker emissions	Complies	

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	+/- 6 kV contact +/- 8 kV air	+/- 6 kV contact +/- 8 kV air	Floors should be wood concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	+/- 2 kV for power supply lines +/- 1 kV for input/output lines	+/- 2 kV for power supply lines +/- 1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	+/- 1 kV differential mode +/- 2 kV common mode	+/- 1 kV differential mode +/- 2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage Dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 5% U_T (>95% dip in U_T) for 0.5 cycle. 40% U_T (60% dip in U_T) for 5 cycles. 70% U_T (30% dip in U_T) for 25 cycles. < 5% U_T (> 95% dip in U_T) for 5 seconds.	< 5% U_T (>95% dip in U_T) for 0.5 cycle. 40% U_T (60% dip in U_T) for 5 cycles. 70% U_T (30% dip in U_T) for 25 cycles. < 5% U_T (> 95% dip in U_T) for 5 seconds.	Mains power quality should be that of a typical commercial or hospital environment. If user of the model 740 requires continued operation during power mains interruptions, it is recommended that the model 740 be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

NOTE: U_T is the A.C. mains voltage prior to application of the test level.

5. SYMBOLS

Units may display the following symbols:



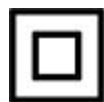
Alternating Current



CAUTION: Before using, read instructions included.



Signifies the device has meet all essential requirements of European Medical Device Directive 93/42/EEC.



Class II equipment (if applicable)

The CAS 740 Monitor is normally a Class I device.

The CAS 740 Monitor becomes a Class II device when it is mounted in an ambulance and connected to a DC power source (740M).



Symbol used on the rear panel of the CAS 740M, to indicate the polarity of the DC power input.



Direct Current



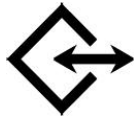
Indicates protection against the effects of the discharge of a cardiac defibrillator. Patient connections are Type BF and protected against defibrillation.



NIBP Hose and Cuff Connector



Pulse Oximeter Probe Connector

SYMBOLS (CONT.)

Two way Communication Port
RS232 and Nurse Call Interface Connector



Temperature Probe Connector

These symbols appear on the front panel in the place of text.



ON/OFF (STANDBY) – Turns “ON” the Monitor's display.

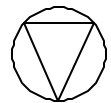
NOTE: Monitors shipped earlier displayed the symbol .



SILENCE/RESET



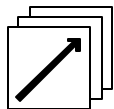
START/STAT



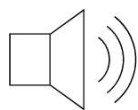
CANCEL



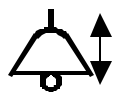
CYCLE TIME



HISTORY

SYMBOLS**(CONT.)**

VOLUME



ALARM LIMITS



ARROW UP



ARROW DOWN

Bar graph display of SpO₂ signal strength.**BPM**

Pulse Rate Display

ADULT

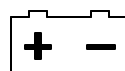
A lighted LED used to indicate NIBP operating in Adult Mode.

NEO

A lighted LED used to indicate NIBP operating in Neonatal Mode.

TEMP

A lighted LED used to indicate the Temperature Option is installed.



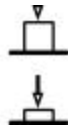
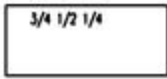
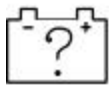
A tri-colored LED used to indicate the status of the monitors power source.

SYMBOLS (CONT.)

These symbols appear on the battery pack in place of text.



Recycling suggested (see General Notes).



Located on the Smart Pack batteries, if available, a set of four (4) LEDs used to indicate the approximate amount of charge remaining in the battery pack.

These symbols appear on the packaging in place of text.



Symbol used to indicate where Relative Humidity information concerning storage and transport can be located.



Symbol used to indicate the minimum and maximum storage and transport Temperatures.

This symbol appears on the printer in place of text.



WARNING: Before removing, read instructions located in User's Manual.

6. MONITOR CONTROLS

FRONT PANEL



Figure 2: Front Panel View

DIGITAL DISPLAY AND INDICATORS

SYSTOLIC mmHg	Red colored LEDs indicate the Systolic pressure measurement in mmHg.
DIASTOLIC mmHg	Red colored LEDs indicate the Diastolic pressure measurement in mmHg.
MAP mmHg	Red colored LEDs indicate the Mean Arterial Pressure in mmHg (if enabled).
TEMP	A Yellow LED indicator with Red colored LEDs indicates temperature value (if installed).

% SpO₂

Green colored LEDs indicates the %SpO₂ value (if installed).

ī BPM

Red colored LEDs indicate the Pulse Rate in BPM (beats per minute).



Green colored LEDs provide a visual indication of the SpO₂ signal strength in a bar graph form (if installed).

ADULT

A yellow LED indicator used to inform the user that the NIBP is operating in the Adult Mode.

NEO

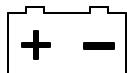
A yellow LED indicator used to inform the user that the NIBP is operating in the Neonatal Mode.

TEMP

A yellow LED indicator used to inform the user that the Temperature Option is installed.

Ready

Message Window area used to display various messages that aid the user in monitor operation.



A tri-colored visual indicator used to display the status of the power source and battery condition.

- GREEN = Charging
- ORANGE = In Use on Battery
- RED = Battery Low or Dead Battery



A visual indicator used along with the SILENCE/RESET pushbutton to display the status of the Audio Alarms.

FRONT PANEL CONTROLS



Figure 3: Front Controls



ON/OFF (STANDBY): Turns “ON” the Monitor’s display.

NOTE: Monitors shipped earlier displayed the symbol .



SILENCE/RESET:

Used to enable and disable the two (2) Minute Audio Off or Permanent Audio Off feature.

Allows the user to clear NIBP, SpO₂ and Temperature messages from the front panel display.

**START/STAT:****START:**

Initiates a blood pressure measurement in the Manual Mode or begins the selected Automatic Cycle.

STAT:

Starts a series of NIBP measurements (depress and hold for two (2) seconds). Continues for five minutes.

**CANCEL:**

Cancels any active blood pressure function and immediately deflates the cuff.

Also used to cancel out of a menu and return to "Ready".

**CYCLE TIME:**

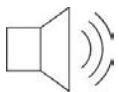
Allows the user to select a time interval for Automatic blood pressure measurement.

Automatic measurement cycles of 1, 2, 3, 4, 5, 10, 15, 30, 60, or 90 minutes may be chosen.

Also used to read the monitor's current time (depress and hold for two (2) seconds).

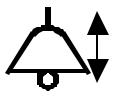
**HISTORY:**

Allows the user to review stored patient readings.

**AUDIO:**

Used to set the volume level of the Alarms and the SpO₂ Beep (if SpO₂ installed). Use the Up and Down Arrows to change.

Also used to adjust the brightness of the front panel displays (depress and hold for two (2) seconds).

**ALARM LIMITS:**

Allows the user to enter and set the monitor's Alarm Limits.

**ARROW
UP:**

Allows forward Adjustment (Auto Cycle, History, Inflation Pressure, Limits and Monitor Configuration).

Depress to cycle through menu selections or depress and hold for quicker advance.

**ARROW
DOWN:**

Allows backwards Adjustment (Auto Cycle, History, Inflation Pressure, Limits and Monitor Configuration).

Depress to cycle through menu selections or depress and hold for quicker advance.

NEXT

The HISTORY and AUDIO pushbutton keys have been programmed to allow the user to advance forward to the next selection in the Monitor Configuration menu.

PREVIOUS

The CYCLE TIME and ALARM LIMITS pushbutton keys have been programmed to allow the user to advance backwards to the previous selection in the Monitor Configuration menu.

INFRARED (IR) DATA PORT

An Infrared (IR) output port, located on the bottom panel of the monitor's front cover, is available to print the NIBP, %SpO₂ and Temperature History data to the optional external printer or other data collection device(s).

REAR PANEL

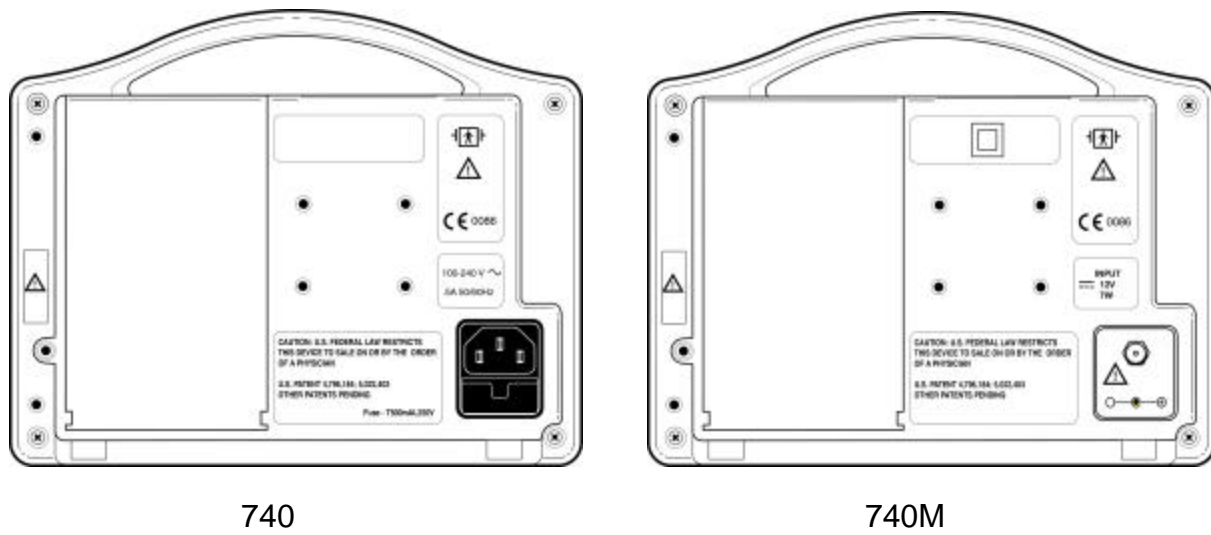


Figure 4: Rear Panel Views

AC / DC CONNECTION

Receptacle for the AC power cord when the CAS 740 Monitor is purchased with an AC Line Power option and built-in battery.

When the CAS 740 Monitor is purchased as an EMS monitor equipped with a Swivel Mount (740M), the ambulance DC power cord is attached here.

FUSE COMPARTMENT

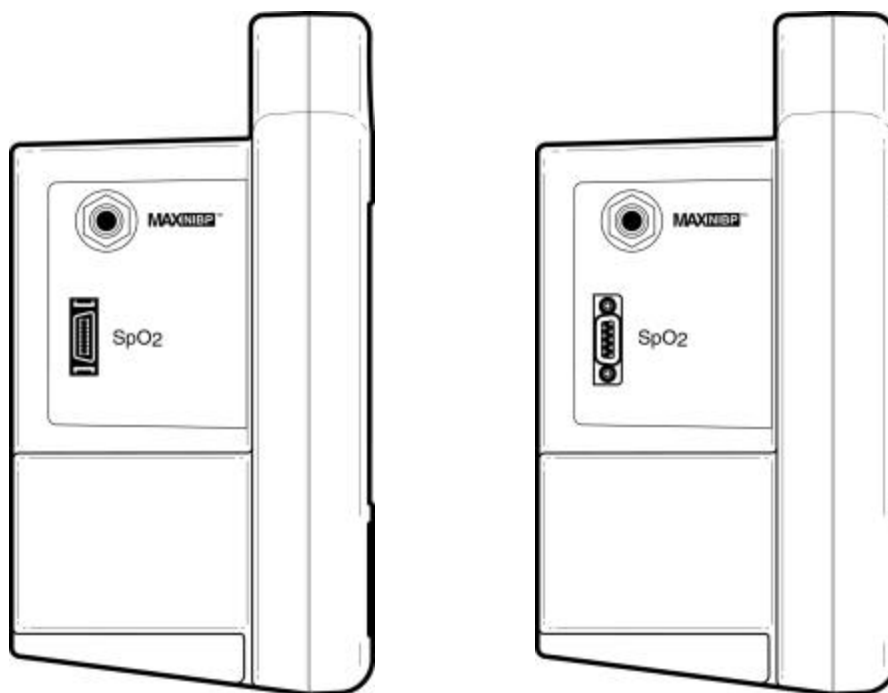
When the CAS 740 Monitor is purchased for AC Line power, the power input receptacle incorporates dual fuses located in the hot and neutral lines.

BATTERY COMPARTMENT

The CAS 740 Monitor is equipped with a 7.2 Volt, 3700 mAh battery pack that, when fully charged, is capable of taking 100 NIBP readings when the monitor is set in the 5-minute Automatic Mode.

NOTE:

The serial number label is located on the bottom of the monitor.

LEFT SIDE VIEW

Masimo and Nellcor

Nonin

Figure 5: Left Panel Views**MAXNIBP™****CUFF HOSE CONNECTION**

The inflation hose is connected to the monitor where the MAXNIBP logo is located as shown in Figure 5. The hose must be connected to the cuff prior to use.

NOTE:

An optional six (6) foot inflation hose is available when monitoring in the NEO mode. Refer to the SPARE PARTS section for part number information.

SpO₂ SENSOR CONNECTION

(if equipped)

Connect the sensor cable in this receptacle for SpO₂ monitoring.

RIGHT SIDE VIEW

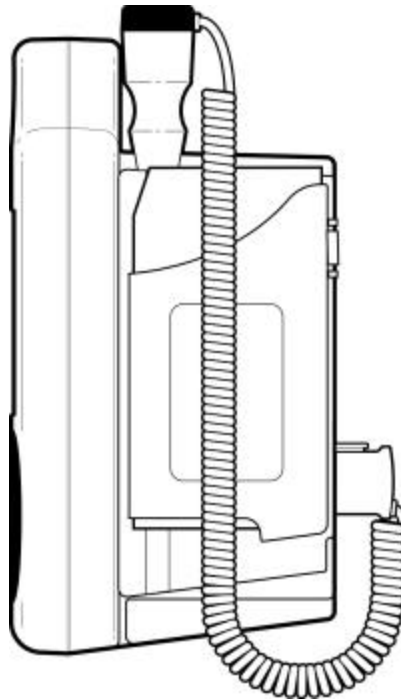


Figure 6: Right Panel View

TEMPERATURE PROBE ELECTRICAL CONNECTION

(if equipped)

Connect the Temperature cable in this receptacle for Temperature monitoring. Leave the probe connection in place. The Temperature function is OFF until the probe is removed from the holder.

TEMPERATURE HOLDER

(if equipped)

Store the Temperature Probe and Temperature Probe Covers in their holder locations when it is not in use.

EXTERNAL DEVICE INTERFACING

The CAS 740 Monitor is available with a combined optional DB9 RS232 output and Nurse Call Interface. The RS232 output maybe used to interface to the Citizen CMP-10 Mobile Printer.

7. MONITOR CONFIGURATION

The Monitor Configuration section allows the user to configure the CAS 740 Monitor. Once entered, the user can:

- Review the monitor's internal Software Revisions
- Set the Operating Language
- Select the Patient Mode
- Select the Temperature Scale
- Make selections for Audio Alarms
- Choose to display the MAP value
- Set the Date
- Set the Time
- Set Daylight Saving Time Option
- Perform System Checks (Refer to CONFIGURATION MODE TESTS)
 - All LEDs "ON" Check
 - +12 Volt Power Supply Check
 - Manometer Mode
 - Pneumatic Pressure Check
 - Temperature Calibration Check

ENTERING THE MONITOR CONFIGURATION MENU

To enter the monitor's Configuration Menu, depress and hold the AUDIO and ALARM LIMITS pushbutton keys while the monitor is being turned "ON".

Once in the menu, use one of the *NEXT* (HISTORY / AUDIO) or *PREVIOUS* (CYCLE TIME / ALARM LIMITS) programmed pushbutton keys to advance onto the next or go back to the previous parameter in the Configuration Menu.

NOTE:

While in the Configuration Menu, if no pushbutton is depressed within 60 seconds, the monitor will automatically save all changes made and exit the Monitor Configuration menu. The Message Window will briefly display "Saving" and return to the "Ready" mode.

SAVING YOUR CHANGES

When you have completed configuring the monitor, press the CANCEL pushbutton to exit and lock in your selection(s). The Message Window will briefly display "Saving" and return to the "Ready" mode.

SOFTWARE REVISIONS

The CAS 740 Monitor displays the current software revision of its operating system and that of the internal modules being used inside. The software versions are displayed in the following order:

Software Module	Message Window
CAS 740 Control Board	VER X.X
Boot Loader	BootX.XX
Power Supply PIC Processor	PIC X.X
CAS NIBP Module	ND X.X
Nellcor SpO ₂ Module ⁽¹⁾	NEL X.X
Masimo SpO ₂ Module ⁽¹⁾	MAS X.X
Nonin SpO ₂ Module ⁽¹⁾	NON XX
Welch Allyn Temperature Module ⁽²⁾	WA X.X

Table 3: Software Revisions

(1) The SpO₂ module is optional, in the case when it is not installed the Version text advances to the next Module.

(2) The Temperature module is optional, in the case when it is not installed the Version text advances to the next Module.

Use the ARROW UP or ARROW DOWN pushbuttons to view the messages.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the CANCEL pushbutton to Save your changes and exit to the “Ready” mode.

SETTING THE LANGUAGE

The CAS 740 Monitor can operate in one (1) of eight (8) languages: English, German, French, Italian, Spanish, Dutch, Swedish or Portuguese.

To configure the monitor’s operating language, first enter the Monitor Configuration menu. Once in the menu, use one of the *NEXT* programmed pushbutton keys until the Message Window displays the current language being used.

Use the ARROW UP or ARROW DOWN pushbuttons to make your selection.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the CANCEL pushbutton to Save your changes and exit to the “Ready” mode.

SELECTING THE PATIENT MODE

The CAS 740 Monitor can be used on patients from Neonates to Adults. To configure the monitor’s operating mode, first enter the Configuration Menu.

Once in the menu, use one of the *NEXT* programmed pushbutton keys until the Message Window displays “PATIENT”.

Use the ARROW UP or ARROW DOWN pushbuttons to select the patient mode. The front panel display will illuminate with the patient mode selected (ADULT = Adult / Pediatric; NEO = Neonate).

NOTE:

Altering the patient mode automatically sets the parameter High and Low Limits to the appropriate patient default limits and affects the NIBP mode. Refer to the CAS 740 Monitor User's Manual for more information.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the CANCEL pushbutton to Save your changes and exit to the "Ready" mode.

SELECTING THE TEMPERATURE SCALE

(available if Temperature is installed)

The CAS 740 Monitor can display Temperature readings in either the Celsius or Fahrenheit scales. To select the operating Temperature scale used by the CAS 740 Monitor, enter the Monitor Configuration menu.

Once in the menu, use one of the *NEXT* programmed pushbutton keys until the Message Window displays the Temperature setup menu "°F" or "°C".

Use the ARROW UP or ARROW DOWN pushbuttons to make your selection.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the CANCEL pushbutton to Save your changes and exit to the "Ready" mode.

AUDIO ALARMS (SILENCE/RESET Pushbutton)

The CAS 740 Monitor's SILENCE/RESET pushbutton can be configured to have the audio associated with patient alarms set to one of three selections. The selections are:

- 2-Minute Audio Alarm Off (Default)
- Permanent Audio Alarm Off
- Alarm Limits Off

To configure the alarms, first enter the Monitor Configuration menu. Once in the menu, use one of the *NEXT* programmed pushbutton keys until the Message Window displays the current value of the Audio Alarms menus.

Use the ARROW UP or ARROW DOWN pushbuttons to make your selection.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the CANCEL pushbutton to save your changes and exit to the "Ready" mode.

2-MINUTE AUDIO ALARM OFF

When the monitor is configured for the 2-Minute Audio Alarm Off setting, use the SILENCE/RESET pushbutton to “enable or disable” audio alarms for a two (2) minute period. The SILENCE visual indicator, located on the front panel of the monitor will be illuminated constantly and the message “2Min Aud” will be displayed on the Message Window as a reminder when enabled. At the end of two (2) minutes, the monitor will automatically exit the 2-Minute Audio Alarm Off setting and return to normal operation.

During a two-minute silence period, if an alarm (patient or equipment) occurs, except for Low Battery and Dead Battery, the audio alarm remains silenced for the remainder of the two-minutes and only a visual indicator is provided.

PERMANENT AUDIO ALARM OFF

When the monitor is configured to the Permanent Audio Alarm Off setting, use the SILENCE/RESET pushbutton to “enable or disable” audio alarms. The SILENCE visual indicator, located on the front panel of the monitor will flash at a rate of one (1) second “ON” and one (1) second “OFF” and the message “Perm Aud” is displayed on the Message Window as a reminder when enabled.

During a permanent audio alarm off period, if an alarm (patient or equipment) occurs, except for Low Battery and Dead Battery, the audio alarm remains silenced and only a visual indicator is provided.

ALARM LIMITS OFF

When the monitor is configured to the Alarm Limit Off setting, all alarms associated with patient alarms are “OFF”. This mode is useful for spot check applications or if the monitor is being moved from patient to patient and the user may not want to be disturbed by any audible alarms.

The SILENCE visual indicator, located on the front panel of the monitor will flash at a rate of two (2) seconds “ON” and two (2) seconds “OFF” and the message “Alrm Off” will be displayed on the Message Window as a reminder when enabled.

During an alarm limit off period, if an equipment alarm occurs, except for Low Battery and Dead Battery, the audio alarm remains silenced and only a visual indicator is provided.

MAP VALUE ENABLE / DISABLE

During a blood pressure reading, the user can elect to display or not to display the MAP value. Enter the Monitor Configuration menu and use one of the *NEXT* programmed pushbutton keys until the Message Window displays the current setting for the MAP value “MAP On” or “MAP Off”.

Use the ARROW UP or ARROW DOWN pushbuttons to make your selection.

NOTE:

When "MAP Off" is selected, MAP values are omitted from History Display and Printing as well. All alarms associated with MAP values are also disabled.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the CANCEL pushbutton to Save your changes and exit to the "Ready" mode.

SETTING THE DATE

The CAS 740 Monitor's Date value is set at the factory. Should it need to be changed, enter the Monitor Configuration menu and use one of the *NEXT* programmed pushbutton keys until the Message Window displays the monitor's date using the following format: "DDMMMYY". Where DD = Day of the Month, MMM = Month of the Year (Jan, Feb, etc.) and YY = Last 2 digits of the year (2002 is displayed as 02). The flashing parameter indicates the parameter that can be changed.

Use the ARROW UP or ARROW DOWN pushbuttons to make your selection. Press one of the *NEXT* programmed pushbutton keys to advance to the next parameter to set within the Date menu.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the CANCEL pushbutton to save your changes and exit to the "Ready" mode.

SETTING THE TIME

The CAS 740 Monitor's Time value is set for Eastern Time and is set at the factory. Should it need to be changed, enter the Monitor Configuration menu and use one of the *NEXT* programmed pushbutton keys until the Message Window displays the monitor's time using the following format: "HH:MM". Where HH = Hour of the Day (0 – 23) and MM = Minute of the Hour (0 – 59). The flashing parameter indicated the parameter that can be changed.

Use the ARROW UP or ARROW DOWN pushbuttons to make your selection. Press one of the *NEXT* programmed pushbutton keys to advance to the next parameter to set within the Time menu.

NOTE:

Altering the Date and Time will affect the History readings, but not erase them.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the CANCEL pushbutton to save your changes and exit to the "Ready" mode.

DAYLIGHT SAVING TIME OPTION

The CAS 740 Monitor can be configured to automatically respond to time changes associated with Daylight Saving Time. The monitor can be configured to one of five Daylight Saving Time Option settings. They are:

- **DST OFF** Daylight Saving Time is “OFF”. The user is responsible for changing the time if needed. This is the default setting for the CAS 740 Monitor.
- **DST N AM** Daylight Saving Time “North America”. Use this setting and the monitor will automatically *add* one (1) hour the first Sunday in April at 2 a.m. and *subtract* (1) hour the last Sunday in October at 2 a.m.
- **DST EU 1, 2, 3** Daylight Saving Time “European Union”.

In the European Union, Daylight Saving Time begins and ends at 1 a.m. Universal Time (Greenwich Mean Time). It starts the last Sunday in March, and ends the last Sunday in October. In the EU, all time zones change at the same moment.

Select EU 1 if the monitor will be located in Ireland, Portugal or the United Kingdom. Select EU 3 for Finland. EU 2 can be used for all remaining countries within the European Union.

NOTE:

Enabling Daylight Saving Time will affect the History readings, but not erase them.

Press one of the *NEXT* programmed pushbutton keys to advance onto the next menu or use the *CANCEL* pushbutton to save your changes and exit to the “Ready” mode.

8. EXTERNAL DEVICE INTERFACING

OVERVIEW

The CAS 740 Monitor is capable of interfacing to an external Serial printer or have the ability to interface to a Nurse Call System if the DB9 RS232/Nurse Call option is available. Both connections are made through the DB9 connector located on the rear panel of the monitor.

WARNING:

The CAS 740 Monitor has been tested with the Citizen CMP-10 Mobile printer to comply with IEC 60601-1-1 and is the only printer that is recommended to be used with the monitor. If another printer is to be used, the user must read the Caution on Page 9 under LEAKAGE CURRENT TEST and follow the guidance given.

RS232

The CAS 740 monitor uses the DB9 connector to interface to the Citizen CMP-10 Mobile printer using the cable supplied with the printer. The connector information provided in this section is made available to allow the user the ability to print the monitor's History data to an external serial printer. Refer to Figure 7 and Table 4 for connection information. Refer to Section 15, SPECIFICATIONS for Serial Interface information.

NURSE CALL INTERFACE

The CAS 740 Monitor provides an isolated relay switch closure output connection between two (2) of the pins on the DB9 RS232/Nurse Call output connector. The output is compatible with most Nurse Call Systems in that there is no polarity to the connection.

When properly connected, the Nurse Call Interface activates the Nurse Call System each time an alarm is activated on the monitor. The delay time for the Nurse Call Interface to activate is less than 0.5 seconds.

The Nurse Call System's relay contacts are rated at 120 VAC at 0.3A; or 30 VDC at 1.0 A.

The Nurse Call Option is available as a normally open (closed on alarm) or normally closed (open on alarm) depending upon how it is wired.

For normally open (N.O.) applications, the Nurse Call system needs to be connected to pins 1 and 9 of the RS232 connector. For normally closed (N.C.) applications, the Nurse Call system needs to be connected to pins 6 and 9. Refer to Figure 7 and Table 4 for more information.

WARNING:

The connection to the Nurse Call Interface should only be installed by a qualified service personnel.

WARNING:

The interconnection of auxiliary equipment to the Nurse Call Interface may increase the total leakage current. The user must read the Caution on Page 9 under LEAKAGE CURRENT TEST and follow the guidance given.

NOTE:

Even though the Nurse Call Interface allows remote alarm indication, it does not replace appropriate bedside surveillance by trained clinicians.

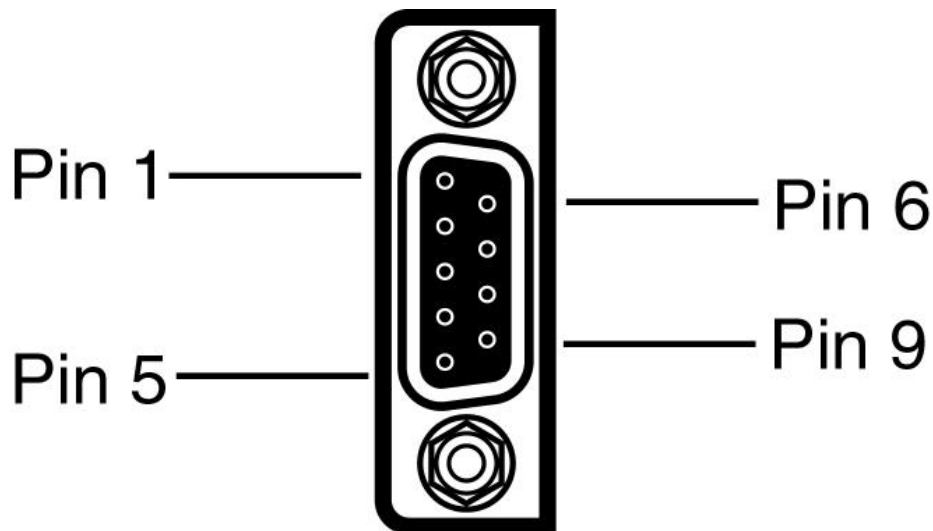


Figure 7: DB9 Male Connector Pin Layout

Pin Number	Signal Description
1	Nurse Call (N.O.)
2	Serial Receive In
3	Serial Transmit Out
4	No Connection
5	Isolated Ground
6	Nurse Call (N.C.)
7	No Connection
8	No Connection
9	Nurse Call (common)

Table 4: DB9 Pin Out

9. ROUTINE MAINTENANCE

CLEANING

CLEANING OVERVIEW

WARNING:

Do not, under any circumstances, perform any testing or maintenance on the monitor while the monitor is being used to monitor a patient.

CAUTION:

Unplug the monitor from the AC power source and remove all the accessories from the monitor before cleaning. The monitor must be turned off and not running on the internal battery. Never clean the monitor when it is being operated.

THE MONITOR

On a daily basis, examine the monitor's case for any damages and check the AC power cord for bent or broken prongs, cracks or fraying. Neither the monitor nor the power cord should be used if damaged. If any damage is noted, contact the appropriate service personnel.

CAUTION:

Do not spray any water or cleaning solution directly onto the monitor.

Every three (3) months, or as needed, clean the monitor using a soft cloth dampened with a mild dishwashing detergent solution and gently rub the soiled area until clean. Use a clean soft cloth to dry the monitor. DO NOT use abrasive cleaners on the monitor. DO NOT use either isopropyl alcohol or solvent to clean the monitor. Use of these cleaners can cause damage to the monitors' surface. DO NOT immerse the monitor or power cord in the cleaning solution.

When necessary, the monitor surfaces may be disinfected using a soft cloth saturated with a 10% (1:10) solution of chlorine bleach in tap water. When all of the surfaces have been disinfected, wipe the entire surface of the monitor using a soft cloth dampened with fresh water to remove any trace amounts of residue and/or fumes.

NOTE:

Thoroughly wipe off any excess cleaning solutions. Care should be taken to prevent water or cleaning solution to run into connector openings or crevices.

THE DISPLAY

CAUTION:

Use care when cleaning the display. Scratches may occur.

Occasionally, as needed, clean the display window using a soft, lint-free cloth sprayed with an alcohol free glass cleaner. DO NOT use either isopropyl alcohol or solvent to clean the display. Use of these cleaners can cause damage to the display. The use of paper towels is not recommended as it may scratch the surface.

CUFFS AND SENSORS

Prior to each patient use, inspect the blood pressure cuffs, SpO₂ finger sensor and cables for damage. The blood pressure cuffs and finger sensors should periodically be cleaned following the manufacturers' instructions for the particular item in use.

CAUTION:

Do not sterilize the sensors by steam or any other method or solution. Do not immerse the sensors in water or cleaning solution.

NOTE:

Refer to the documentation enclosed with each accessory for any additional sterilization or disinfection instructions.

PNEUMATIC TUBING

Prior to each patient use, inspect the NIBP Inflation Hose for proper connection, cracks and kinks. As necessary, clean the pneumatic tubing using a soft cloth dampened with a germicidal solution.

PRINTER

When the printer becomes dirty, wipe with a soft dry cloth. For extreme dirt buildup, soak a cloth with mild detergent, wring well and wipe. Dry by wiping with a soft dry cloth.

CAUTION:

Before cleaning the printer, disconnect the AC adapter from the printer.
Do not use volatile chemicals such as thinner, benzene, etc.
Never wet the inside of the printer mechanism.

Refer to the printer User's Manual for more information.

PNEUMATIC PRESSURE CHECK

A check of the monitor's pneumatic pressure system should be performed every six (6) months.

SAFETY CHECKS

The following Safety Checks should be performed at least every twelve (12) months by a qualified service technician.

- Inspect the equipment for mechanical and functional damage.

SYSTEM CHECKS

The following System Checks should be performed at least every twelve (12) months by a qualified service technician.

- All LEDs "ON" Check
- +12 Volt Power Supply Check
- System Pressure Checks
- Overpressure Check
- Temperature Calibration Check
- Oximetry Calibration Check
- Chassis Leakage

The following Electrical Safety Check should be performed any time the case is opened or patient isolation is in question.

- Hypot

BATTERY

CAS Medical Systems recommends replacing the monitor's battery every two (2) years.

When the CAS 740 Monitor is going to be stored for two (2) months or more, remove the battery prior to storage. To remove the battery, refer to Section *REPLACING THE MONITOR BATTERY*.

If the CAS 740 Monitor has been stored for more than thirty (30) days, charge the battery as described in Section *BATTERY CHARGE*. A fully discharged battery requires four (4) hours to receive a full charge. The battery is being charged whenever the monitor is connected to a power source (AC Line Power or +12 VDC).

10. TROUBLESHOOTING

SYSTEM TROUBLESHOOTING

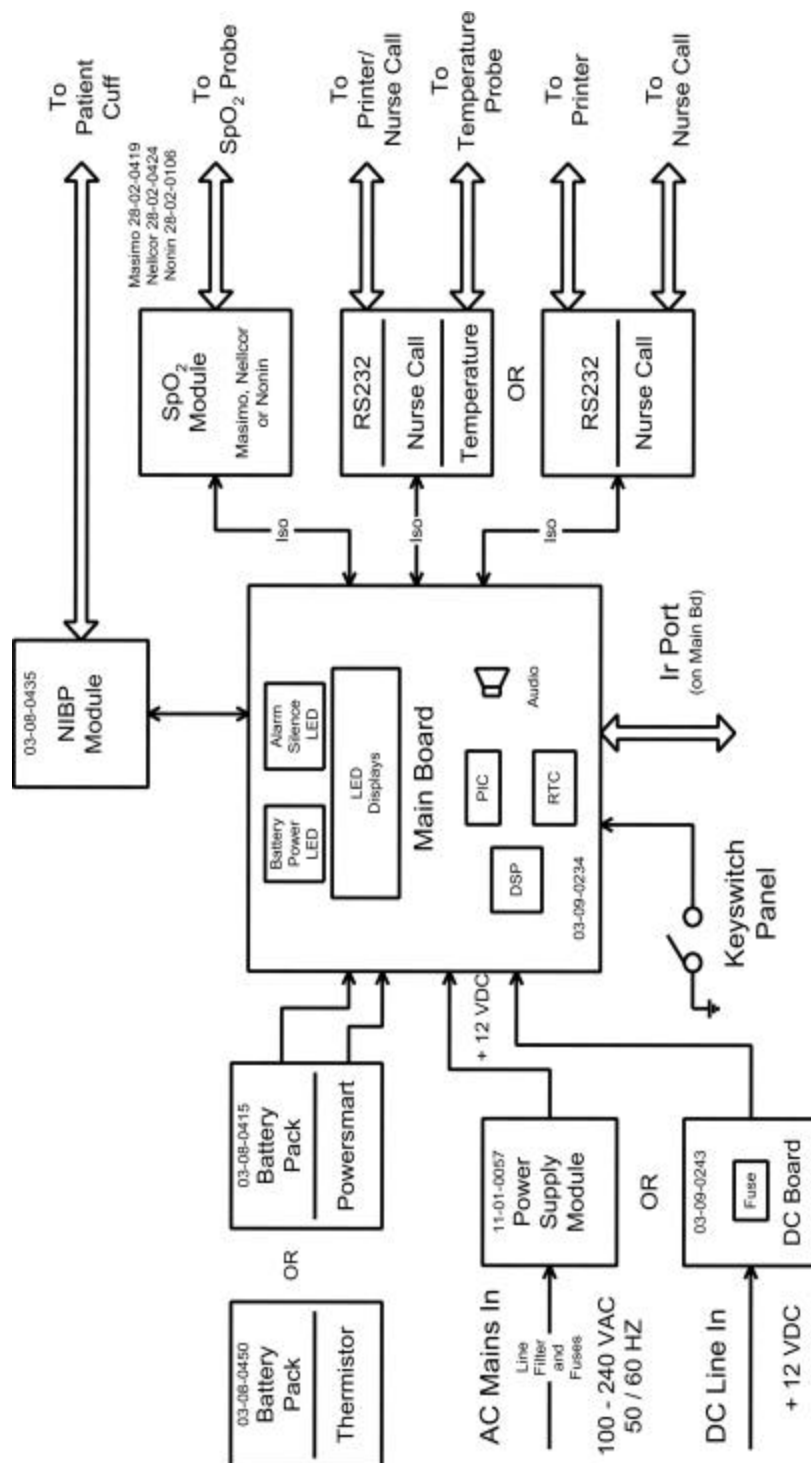
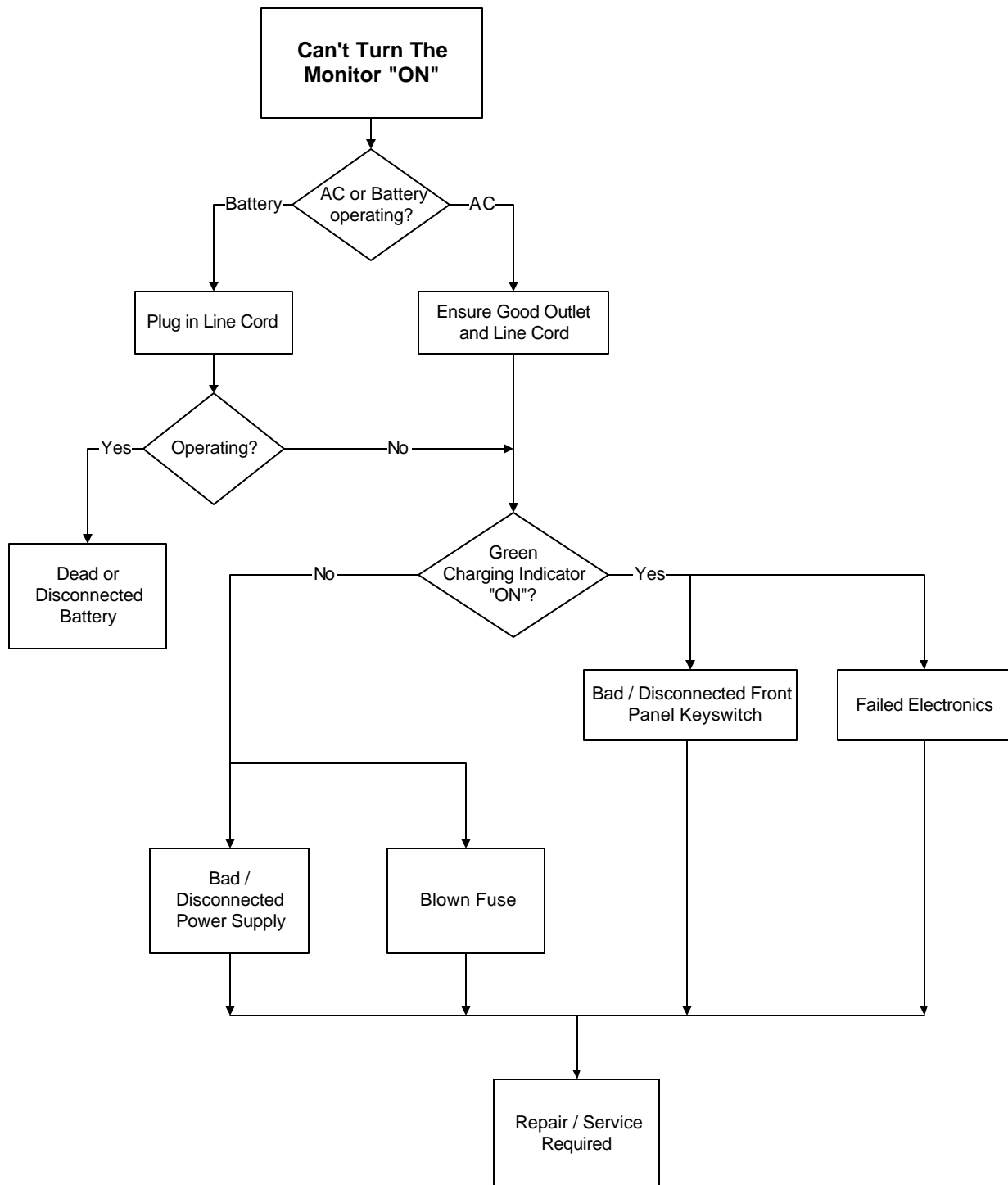
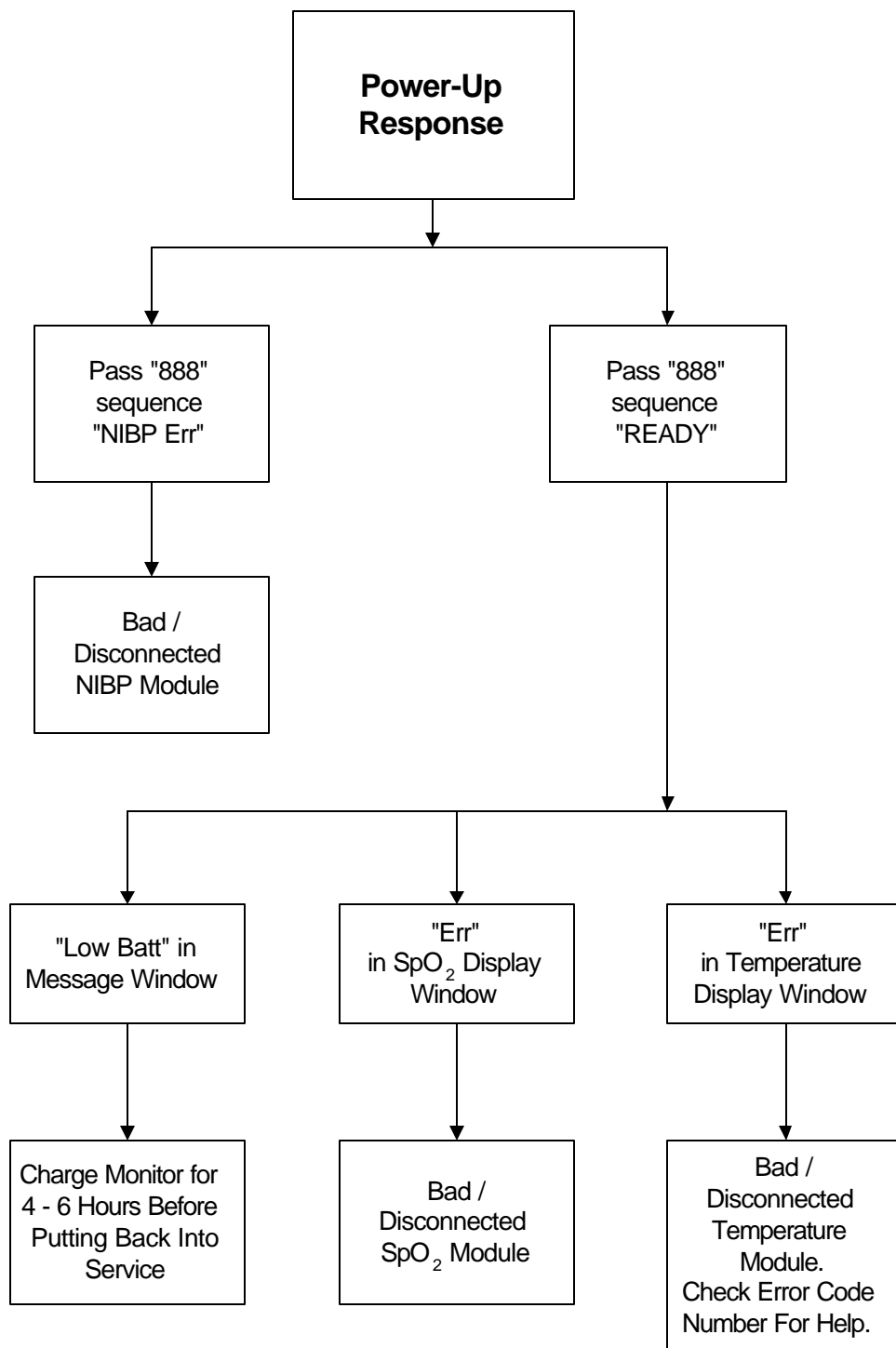


Figure 8: Model 740 Monitor Overall Block Diagram

**Figure 9: No Monitor Power**

**Figure 10: Power Up Response**

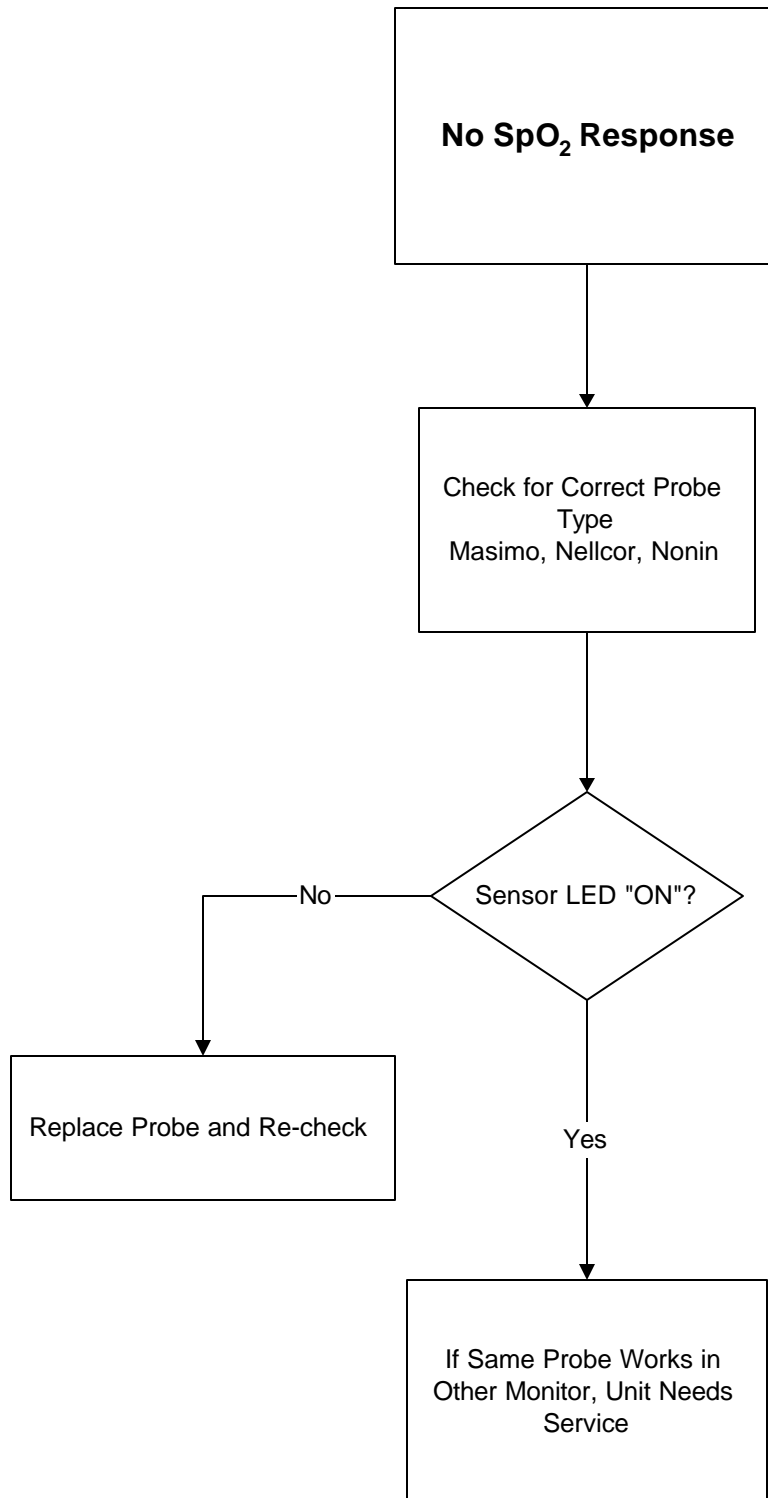
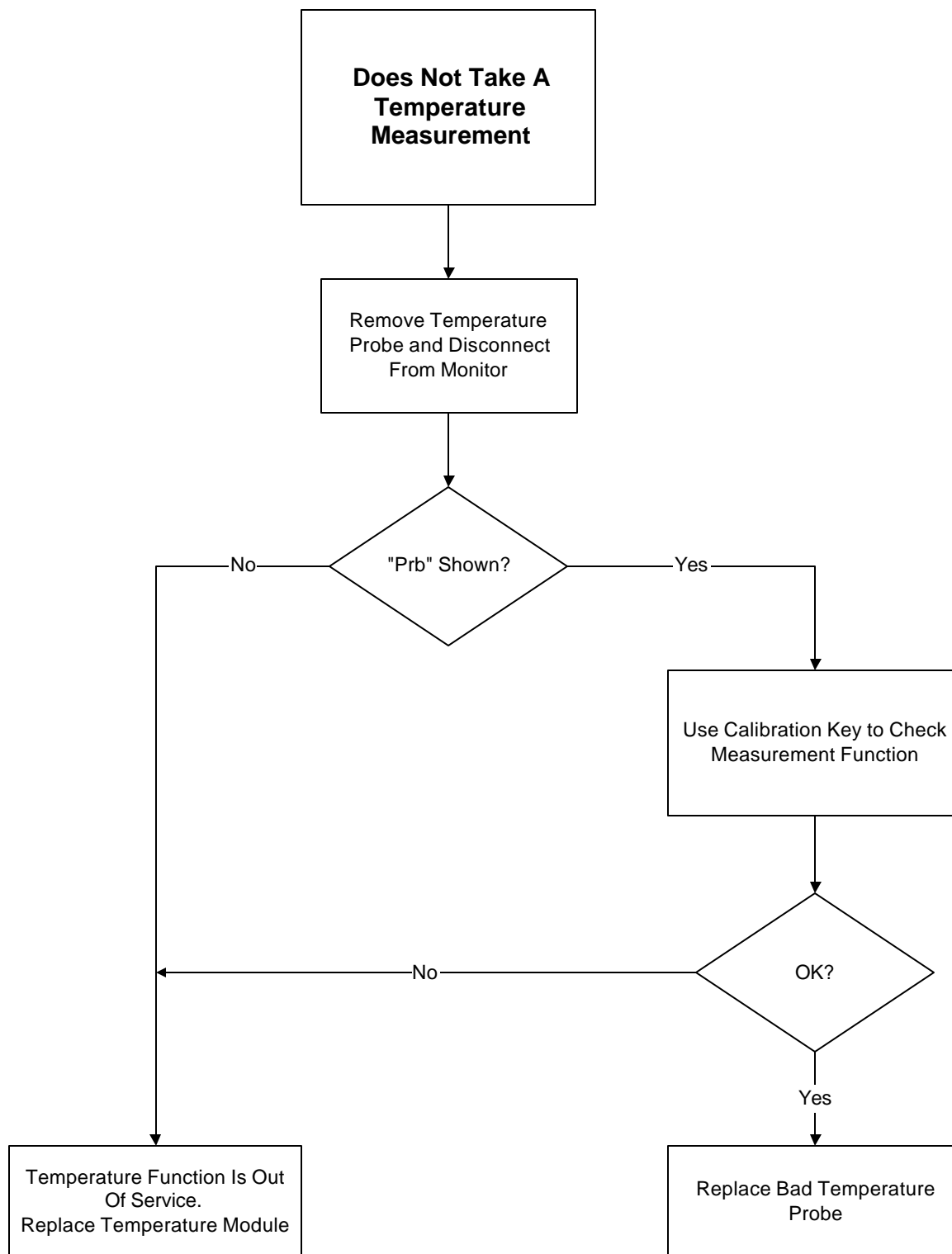


Figure 11: SpO₂ Trouble Shooting

**Figure 12: Temperature Trouble Shooting**

THEORY OF OPERATION

The CAS 740 Monitor's Main Control Board provides the following functions for the operation of the monitor.

- Power Supplies
- Battery Charger
- Supervisor Microcontroller (Microchip PIC 16F73)
 1. Indicator LEDs
 2. Temperature Monitoring
 3. Power Smart Module
 4. Power ON/OFF and Reset to Digital Signal Processor Controller
 5. Monitor ON/OFF
 6. Communication with Digital Signal Processor Controller
 7. Monitor Battery Charger and Battery conditions
- Digital Signal Processor Controller (Motorola DSP 56F827)
 1. SpO₂ Monitoring
 2. Blood Pressure Monitoring
 3. Keypad Monitoring
 4. Indicator LEDS and Displays
 5. Real-Time Clock
 6. Alarms
 7. Serial Interface

POWER SUPPLIES

The input to the 740 Main Control Board comes from either the DC input (J1) or the Battery Input (J2). A Control chip (U6) is responsible for selecting the monitor's main power source. The DC input always takes priority over the Battery.

Battery	7.2 Volts @ 4.0 Ahr (TP7 to TP33)
DC	12 Volts @ 28 Watts (TP28 to TP29)

There are several supplies that are generated for internal use.

+Vpic TP5 The power supply for the Microchip PIC16F73 (U5), the Supervisor of the CAS 740 Main Control Board.

The DC input or the Battery input, if there is no DC present, goes into a voltage regulator (U4) to supply the +3.3 volts.

+5V TP1 Power supply voltage for the main Analog and Digital circuitry.

The DC input or the Battery input, if there is no DC present, goes into a switching regulator (U1) to supply +5 volts. The regulator is turned on and off by the Microcontroller (U5).

+3.3V TP2 Chip I/O supply voltage for the DSP Controller (U20).

The +5 volts output of the switching regulator (U1) goes into a voltage regulator (U2) to supply the +3.3 volts.

+2.5V TP3 Core operating voltage for the DSP Controller (U20).

The +5 volts output of the switching regulator (U1) goes into a voltage regulator (U3) to supply the +2.5 volts.

+5V_ISO1 TP20 Isolated power supply for the Temperature Module circuit.

The +5 volts output of the switching regulator (U1) goes into a dc-dc converter (U17) to supply +5 volts to the Temperature Module circuit. The converter provides an isolation voltage of 2.5KV. The dc-dc converter is turned on and off by the DSP controller (U20) and transistor (Q12).

+5V_ISO2 TP8 Isolated power supply for the SpO₂ circuit.

The +5 volts output of the switching regulator (U1) goes into a dc-dc converter (U9) to supply +7 volts. The converter provides an isolation voltage of 2.5KV. The dc-dc converter is turned on and off by the DSP controller (U20) and transistor (Q7). The output of the converter feeds a +5 volt regulator (U22) that provides voltage for the SpO₂ board.

+5VCRG TP6 Power supply for the Battery Charger.

The DC input goes into a voltage regulator (U7) to supply the +5 volts.

+VND TP4 Power supply for the Blood Pressure pump.

The DC input or the Battery input, if there is no DC present, goes into a voltage regulator (U27) to supply the +6 volts. The voltage regulator is turned on and off by the DSP controller (U20) and transistors (Q16 and Q17).

BATTERY CHARGER

The battery charging is controlled by U8.

SUPERVISOR MICROCONTROLLER

The Microchip PIC16F73 (U5) is the supervisor of the Main Control Board. The controller has 4K of program flash, 192 bytes of data memory and operates from an external 153.6KHz crystal. The Microcontroller has 22 I/O's, 3 timers, 2 PWM/capture/compare modules, UART, SPI, and five (5) 8bit analog-to-digital channels.

Indicator LED's

LED1 is the power/low battery/charging indicator that is controlled by an output port of the Microcontroller (U5).

Temperature Monitoring

The Temperature module is an option that is plugged into J8 and J9 of the Main Control Board. The isolated power supply for the Temperature Module circuit (+5V_ISO1) is controlled by an output pin of the Supervisor (U5 pin 28). The Module is read by the Supervisor (U5) thru the serial port. The Temperature information is then sent to the DSP (U20) thru the SPI port.

Power Smart Module

The Power Smart Module option comes into the Main Control Board at J2 (pins 2 and 3). The Power Smart Module is read by the Supervisor (U5 pins 25 and 26) then sent to the DSP (U20) thru the SPI port.

Power ON/OFF and Reset to Digital Signal Processor Controller

The Power switch comes into the Main Control Board at keypad connector J6. It is read as an input pin to the Supervisor (U5 pin 21).

The Supervisor has an output pin (U5 pin 7) that controls the reset to the DSP (U20).

Monitor ON/OFF (+5V ENABLE)

The monitor turning on and off is control by an output pin of the Supervisor (U5 pin 11) and associated components Q1 and Q2.

Communication with Digital Signal Processor Controller

The Supervisor (U5) has two-way communication to the DSP (U20) using a dedicated SPI line.

Monitor Battery Charger and Battery Conditions

The DC input and Battery inputs are read by two analog to digital converter of the Supervisor (U5 pins 2 and 3). The results of these signals are used to control the Low and Dead Battery conditions of the monitor and the status of the front panel Power / Charging LED (LED 1).

Two output lines from the Battery Charger Control chip (U8) are read by the Supervisor (U5 pins 23 and 24). The information from these pins informs the Supervisor the status of the charging condition (fast charge, trickle charge or hold off). All of the information is sent from the Supervisor to the DSP (U20) thru the SPI port.

DIGITAL SIGNAL PROCESSOR CONTROLLER

The Motorola DSP56F827, is Digital Signal Processor (DSP U20) and is the Main Controller of the CAS 740 Monitor. The controller has 64K of program flash, 4K of data flash, 1K program ram, 4K of data ram and operates off an external 4 MHz crystal. The DSP features are PLL, 2 SPI ports, TOD, watchdog timer, quad timer, 16 dedicated I/O, 48 shared I/O, 64 muxed I/O, interrupt controller, 8 programmable chip selects and 32 external bus signals.

SpO₂ Monitoring

The SpO₂ Module is an option that is plugged into the Main Control Board, J3 for Nellcor and Nonin or J5 for Masimo. The isolated power supply for the SpO₂ Module circuit (+5V_ISO2) is controlled by an output pin of the DSP (U20 pin 37). The Module is read by the DSP (U20) thru the serial port (TXD2 and RXD2) and associated components (U10, Q9, Q10, ISO1 and ISO2). The power is turned off when the SpO₂ option is not installed.

Blood Pressure Monitoring

The Blood Pressure Module is plugged into J4 of the Main Control Board. The power (+VND) of the Blood Pressure Module is controlled by an output pin of the DSP (U20 pin 36). The Blood Pressure Module is read by the DSP (U20) thru the serial port (TXD1 and RXD1).

Keypad Monitoring

The keypad comes into the Main Control Board at J6. There are eight keys are read as inputs by the DSP (U20 pins 116 - 124). The keys are normally high and active low when the switch is depressed.

Indicator LED'S and Displays

U11, U13, U14, U15 and U16 are seven segment LED driver IC's that are controlled thru the SPI port of the DSP (U20). They are used to display Temperature, Diastolic, MAP, %SpO₂, Systolic, BPM, SpO₂ bar graph, ADULT led, NEO led, TEMP led, Silence led and the two slash led's. U12 is an eight character smart alphanumeric display (Message Window) that is driven by the DSP (U20) directly.

Real-Time Clock

The real-time clock (U21) is controlled by the DSP (U20) thru the SPI port. The part has it own battery and internal crystal. The battery can be replaced separately when needed.

Alarms

The alarms circuit has an audio attenuator (U23), an amplifier (U24) and a speaker (LS1). The sound is controlled by the DSP (U20).

Serial Interface

The serial input/output goes into the Main Control Board on J10. The serial port is controlled by the DSP (U20).

ERROR MESSAGES

The CAS 740 Monitor displays a variety of messages to aid the user in monitor operation. If a troubleshooting message is displayed during a measurement, follow the actions listed to correct the situation.

If the monitor does not turn on, or exhibits a flashing display and failure to operate, the battery is most likely below the Dead Battery point. Connect the monitor to a power source (AC Line Power or +12 VDC) and allow it to charge for four (4) hours.

If the monitor is in need of repair, it must be referred to the appropriate service personnel. Service performed by unauthorized personnel could be detrimental to the monitor and will void the warranty. For service, contact your dealer or CAS Medical Systems, Inc.

SpO₂ USER MESSAGES

(available if SpO₂ is installed)

If the accuracy of any measurement does not seem reasonable, first check the patient's vital signs by an alternate method.

NOTE:

The SpO₂ probe must be kept as motionless as possible to make a proper determination. Use the SpO₂ strength bar graph to determine if a strong rhythmic pulse signal is present.

When no oximeter probe is attached to the monitor, the %SpO₂ window and signal strength window will be blank. When no SpO₂ pulse data is available, the monitor will display the last NIBP pulse.

When the probe is connected to the monitor, but is off of the patient, the message “—” is displayed in the %SpO₂ and Pulse Rate windows. The Message Window flashes the message “Prb OFF” and three (3) audio “beeps” are heard every twenty-five (25) seconds.

Depress the SILENCE/RESET pushbutton. The monitor silences the audible alarm tone, but the message remains.

If the message “Prb” should appear in the %SpO₂ window, verify that the probe being used is the correct one for the monitor's SpO₂ configuration (Masimo, Nellcor, Nonin) or that the probe is not defective. Depress the SILENCE/RESET pushbutton. The monitor silences the audio alarm tone, but the message remains. Remove the defective probe and replace it with a working probe.

If the SpO₂ Module located inside the CAS 740 Monitor should fail, the message “Err” will appear in the %SpO₂ display window. Depress the SILENCE/RESET pushbutton. The monitor silences the audio alarm tone, but the message remains.

Should any of the above problems persist, contact your dealer or CAS Medical Systems, Inc.

TEMPERATURE FUNCTION USER MESSAGES

(available if SpO₂ is installed)

If the probe becomes unattached to the CAS 740 Monitor's rear panel connector, the message "Prb" is shown in the TEMP display window.

NOTE:

Depress the SILENCE/RESET pushbutton to clear the TEMP display.

When an attached probe is removed from the probe holder, the message OrL, ALy or rEC is shown briefly in the TEMP display window indicating the predictive algorithm is being used by the Temperature function.

When the message "Err XX", where "XX" is an Error Number, is displayed in the TEMP display window an error condition has occurred and a reliable temperature reading could not be obtained.

NOTE:

Depress the SILENCE/RESET pushbutton to clear the TEMP display.

Refer to Table 5, Temperature Error Codes for more information.

Verify the monitor's operating environment are within its limits and start the procedure from the beginning.

ERROR NUMBER	ERROR DESCRIPTION
00	Transmit buffer overflow.
01	Probe heater energy accumulation too high.
02	Probe a/d pulse width out of range.
03	Adaptive probe gain too high or too low.
11	Ambient temperature above 104 °F.
12	Ambient temperature below 60.8 °F.
21	Battery voltage below error threshold of 3.0 volts.
31	RAM read/write error.
32	ROM checksum error.
33	CPU instruction error.
40	PTB resistor a/d pulse width out of range.
41	RatioCal resistor a/d pulse width out of range.
42	External ambient thermistor a/d pulse width out of range.
50	Heater circuit failure.
51	Probe heated above 112 °F.
52	Heater watchdog timeout failure.
60	PTB resistor "temperature" out of range.
99	Temperature option no longer recognized.

Table 5: Temperature Error Codes

Should any of these problems persist, contact your dealer or CAS Medical Systems, Inc.

ERROR MESSAGES ON THE MESSAGE WINDOW

The CAS 740 Monitor displays a variety of messages on the Message Window to aid the user.

ERROR MESSAGE	POSSIBLE CAUSE	POSSIBLE SOLUTION
"Air Leak"	Air leak in cuff/hose/monitor pneumatic system.	Check that the cuff/hose/monitor connection is secure. Check cuff for leaks. DO NOT use a known leaky cuff.
"Appl Err"	Neonate cuff is detected in Adult Mode.	Check cuff. Replace cuff or change operating mode
"Chk Prb" (Masimo)	The monitor is questioning the quality of the signal being received by the SpO ₂ sensor. The sensor is receiving too much ambient light.	Verify that the sensor is being used according to the manufacturer's recommendations. Verify that the sensor emitter and detector are parallel to and directly opposing each other.
"ChksumEr"	An electronic failure has occurred within the monitors' Main Control Board.	Contact CAS Medical Systems to have the monitor serviced.
"Dead Bat"	The battery is fully discharged.	Recharge the battery for at least 4 hours.
"Flow Err"	Stable cuff pressure cannot be maintained by the pneumatic system.	Check the external tube for kinks. Perform a Pneumatic Check as detailed in the Maintenance section of this manual. Replace cuff.
"LooseCuf"	Cuff applied too loosely.	Check cuff for proper fit on patient.
"Low Batt"	The battery is almost discharged.	At least 30 minutes of operation is available from when the message first appears. Recharge the battery as soon as possible.
"Low Perf" (Masimo)	The perfusion level being received by the SpO ₂ sensor is low.	Determine if an extreme change in the patient's physiology and blood flow at the monitoring site occurred (e.g. an inflated blood pressure cuff, a squeezing motion). Try to warm the patient or sensor site. Move sensor to a site with better perfusion.

Table 6: Error Messages on the Message Window

ERROR MESSAGES ON THE MESSAGE WINDOW (cont.)

ERROR MESSAGE	POSSIBLE CAUSE	POSSIBLE SOLUTION
"Motion"	There was too much extremity motion for the monitor to accurately complete the NIBP measurement in 120 seconds.	Measurements can be obtained when there is limited extremity movement, but the measurement time may be extended. Measurement time is limited to 120 seconds. Restrain patient extremity motion.
"NBP Cal"	Pressure calibration data corrupted within NIBP module.	Pressure module needs recalibration. Contact CAS Medical Systems to have the monitor serviced.
"NIBP Err"	An electronic failure has occurred within the NIBP module.	Contact CAS Medical Systems to have the monitor serviced.
"No Probe"	The monitor is not detecting the SpO ₂ probe.	The probe was disconnected from either the Interface Cable or from the monitor.
"OverPres"	Cuff pressure exceeded 290 mmHg in the Adult mode or 145 mmHg in the Neonatal mode.	Very rapid squeezing of the cuff can cause this error. Repeat the measurement. If this message repeatedly occurs during normal use, the monitor must be serviced.
"P Search"	The monitor is searching for a Pulse signal.	Normal at power-up as the monitor searches for a pulse. The probe position may have changed. Check the probe site.
"Prb OFF"	The monitor is no longer receiving a patient signal from the SpO ₂ probe.	The probe is no longer in contact with the patient. Check the probe site.
"Pwr Fail"	Power was disconnected from the monitor.	Depress the SILENCE/RESET pushbutton to clear the message. Re-cycle the monitor's power.
"RangeErr"	The systolic reading exceeds the measurement range of 255 mmHg in the Adult mode or 135 mmHg in the Neonatal mode.	Repeat measurement. If the message is displayed again, use another method to measure the patient's blood pressure.

Table 6: Error Messages on the Message Window

ERROR MESSAGES ON THE MESSAGE WINDOW (cont.)

ERROR MESSAGE	POSSIBLE CAUSE	POSSIBLE SOLUTION
"SetClock"	The monitor's clock needs to be set.	<p>The monitor's time and date values are incorrect.</p> <p>Refer to sections: <i>SETTING THE DATE</i> and <i>SETTING THE TIME</i> for more information.</p> <p>The monitor's internal clock battery needs to be replaced. Contact CAS Medical Systems.</p>
"Signal ?" (Masimo)	The quality of the signal level being received by the SpO ₂ sensor is in question.	<p>Ensure proper sensor type and application.</p> <p>Verify that the sensor emitter and detector are parallel to and directly opposing each other.</p> <p>Clean or replace the sensor.</p>
"Sig Sat"	Motion pulses too strong.	<p>Limit patient activity; the arm must be still and/or relaxed.</p> <p>Repeat measurement.</p>
"Time Out"	The monitor was unable to complete a measurement within 120 seconds in the Adult mode or 90 seconds in the Neonatal mode.	<p>An extremely long measurement can be due to a loose cuff, high blood pressure, or monitor re-pumps.</p> <p>Try measurement again. Try higher initial pressure.</p> <p>If message consistently reappears try using another means to obtain patient's blood pressure.</p>
"Weak Sig"	The monitor did not detect any pulses during a NIBP measurement.	<p>Check the fit of the cuff.</p> <p>Repeat measurement.</p>

Table 6: Error Messages on the Message Window

11. MAINTENANCE PROCEDURES

INTRODUCTION

This section discusses the tests used to verify performance following repairs or during routine maintenance. All tests can be performed without removing the CAS 740 Monitor's cover.

If the CAS 740 Monitor fails to perform as specified in any test, repairs must be made to correct the problem before the monitor is returned to the user.

EQUIPMENT REQUIRED

To test the NIBP

- P9 Calibration Kit
- Mercury Manometer
- NIBP Simulator
- 500 mL Pressure Cylinder (CAS p/n 01-02-0248)

To test the Temperature

- Temperature Calibration Key (CAS p/n 01-02-0095)

To test the SpO₂

- SpO₂ Finger Sensor Simulator

To perform Electrical Safety

- Electrical Safety Analyzer
- Hypot Tester

Data Sheet

This procedure uses a Data Sheet as the record for verifying monitor performance. Once the procedure is completed, CAS recommends the Data Sheet be kept with the respective monitor's Device History Record should verification of monitor performance be questioned.

The *DATA SHEET* can be found on page 61.

BATTERY CHARGE

Perform the following procedure to fully charge the battery.

- 1) Connect the monitor to an AC power source.
- 2) Verify that the monitor is "OFF" and that the Battery Power Visual Indicator is lit Green.
- 3) Charge the battery for at least four (4) hours.

TURNING THE CAS 740 MONITOR "ON"

Perform the following procedure to verify the CAS 740 Monitor powers "ON" properly.

- 1) Connect the monitor to an AC power source.
- 2) Verify that the monitor is "OFF" and that the Battery Power Visual Indicator is lit Green.
- 3) Do not connect any cables to the monitor.
- 4) Press the ON/OFF (STANDBY) pushbutton on the front panel to turn the monitor "ON".

Upon applying power to the monitor, the CAS 740 Monitor displays a one (1) second Configuration Setup Test and conducts a four (4) second electronic Power On Self-Test (POST) to ensure that its internal circuits are functioning properly.

NOTE:

The user should use the Power On Self Test as a verification tool that all front panel visual indicators and the audio are functioning properly.

The one (1) second Configuration Setup Test is a visual indication of the CAS 740 Monitor's current configuration. It consists of the monitor's Model number and a description of its power source (740 or 740M), an Installed Parameter Code (1, 2, 3) and a one (1) or two (2) character module configuration code.

As an example, upon power-up the CAS 740 Monitor displays: 740-2MS.

- The first set of characters indicates the Model number and the source of its power supply (740 = Internal/AC Line Power or 740M = DC connection).
- The second character (2) describes how many parameters are installed in the monitor. The monitor in our example is configured for NIBP and SpO₂. Installed Parameter Codes include;
 - (1) = NIBP; (2) = NIBP and SpO₂ or Temperature; (3) = NIBP, SpO₂ and Temperature
- The third set of characters (MS) describes the type of module installed. The monitor in our example is configured for Masimo oximeter. Configuration Codes are;
 - MS = Masimo; NL = Nellcor; NN = Nonin; T = Temperature

The four (4) second Power On Self-Test consists of:

- All equipped parameter segments are lit for one (1) second.
- All High Alarm Values are displayed for one (1) second in their corresponding numeric display window and an audible tone is emitted from the monitor's internal speaker. The Message Window indicates "HI LIMS".
- All Low Alarm Values are displayed for one (1) second in their corresponding numeric display window and an audible tone is emitted from the monitor's internal speaker. The Message Window indicates "LO LIMS".
- The monitor's current time is displayed for 1 second.

Once the test is completed, the monitor indicates that it is "Ready" for use.

DISPLAYING THE TIME

Perform the following procedure to verify the time is set correctly.


Depress and hold the CYCLE TIME pushbutton for two (2) seconds.

The monitor displays the time, in 24 Hr. format in the Message Window for as long as the pushbutton is depressed.

Should the time being displayed not be correct, refer to Section SETTING THE TIME.

ALARM AUDIO

Perform the following procedure to verify the audio range for the Alarm volume.

Depress the AUDIO pushbutton on the front panel. Verify a Key Click tone is heard and the Message Window displays "ALARM .

Depress the VOLUME UP and VOLUME DOWN pushbuttons and verify the Alarm Volume can be adjusted to one of five volume levels.

Set the volume level as desired.

Press the CANCEL pushbutton when completed.

NOTE:

The Alarm Volume level cannot be set to "OFF".


NOTE:

No Key Click will be heard when the Audio Alarm Volume is set to a MINIMUM setting.

SpO₂ AUDIO

(available if SpO₂ is installed)

Perform the following procedure to verify the audio range for the SpO₂ volume.

Depress the AUDIO pushbutton twice. Verify a Key Click tone is heard each time and the Message Window displays “SpO₂ 

Depress the VOLUME UP and VOLUME DOWN pushbuttons and verify the SpO₂ “beep” volume can be adjusted to one of five volume levels and “OFF”.

Set the volume level as desired.

Press the CANCEL pushbutton when completed.

CONFIGURATION MODE TESTS

Perform the following procedures to verify the following system operations of the monitor.

NOTE:

The monitor must be in the Configuration Mode in order to perform the following functions.

- All LEDs “ON” Check
- +12 Volt Power Supply Check
- Calibration Check
 - System Pressure
 - Over Pressure
- Pneumatic Pressure Checks
- Temperature Calibration Check

ENTERING THE TEST MODE

To enter the monitor Configuration Menu, depress and hold the AUDIO and ALARM LIMITS pushbutton keys while the monitor is being turned “ON”.

Once in the menu, depress one of the *PREVIOUS* (CYCLE TIME / ALARM LIMITS) programmed pushbutton keys until the Message Window briefly displays “Test Mode” followed by “0 mmHg”.

NOTE:

While in the Test Mode if no pushbutton is depressed within 15 minutes, the monitor will automatically terminate the Monitor Configuration menu and return to the “Ready” mode.

WARNING:

DO NOT place the monitor in the TEST MODE when a cuff is attached to a patient.

EXIT THE TEST MODE

When you have completed with the Test Mode, press the CANCEL pushbutton to exit. The Message Window will briefly display "Saving" and return to the "Ready" state.

LED CHECK

Perform the following procedure to verify the functionality of all front panel LED displays and visual indicators.

Enter the Test Mode. The Message Window will briefly display "TEST MODE" followed by "0 mmHg".

Depress and hold either the ARROW UP or ARROW DOWN pushbuttons.

The monitor will illuminate all appropriate 7-segment displays, bar graph, bell icon and patient mode indicators for as long as the button is depressed.

+12 VOLT POWER SUPPLY CHECK

Perform the following procedure to verify the proper DC input voltage to the Main Control Board.

Enter the Test Mode. The Message Window will briefly display "TEST MODE" followed by "0 mmHg".

Depress and hold the SILENCE/RESET pushbutton.

The monitor will display the input voltage (VDC) reading in the Message Window. Verify the value to be 12 +/- 0.50 V.

CALIBRATION CHECK

A Calibration Kit, (product #P9) is included with the monitor. The kit contains a T-connector with a male and a female luer fitting (for a Calibration Check) and a male luer plug (to be used for the Pneumatic Check).

Obtain a mercury manometer whose accuracy meets the AAMI/ANSI Standard for Non-Automated Sphygmomanometers, 1994.

SYSTEM PRESSURE

Assemble the Calibration Kit according to the diagram provided in the P9 kit.

- 1) Remove the manometer tubing from the inflation bulb. Connect the open ended tubing of the T-connector to the inflation bulb.
- 2) Connect the female luer fitting to the inflation tube leading to the manometer.

- 3) Connect the male luer fitting to the manometer tubing.
- 4) Enter the Test Mode. The Message Window will briefly display "TEST MODE" followed by "0 mmHg".
- 5) Use the manometer inflation bulb to slowly inflate the system to 200 mmHg. The monitor display should read 200 mmHg +/- 5 mmHg. Hold the pressure at that point for 30 seconds.

NOTE:

If the monitor does not display the test pressure for the 30-second period, deflate to zero and verify the proper assembly of the calibration set-up. Re-inflate the system. If the monitor again fails to hold the pressure, it is recommended the monitor be returned to CAS Medical Systems for service.

Inflate the system, pausing at the following points to verify calibration:

0 mmHg +/- 1 mmHg

50 mmHg +/- 4 mmHg

100 mmHg +/- 4 mmHg

150 mmHg +/- 4 mmHg

200 mmHg +/- 5 mmHg

OVERPRESSURE

Inflate the pressure slowly until 290 mmHg +/- 10 mmHg is reached. The Message Window should stop updating and display the message "OverPres".

Press the CANCEL pushbutton to exit the Overpressure Test. The monitor returns to the Calibration Check function.

If the monitor does not meet the above specifications, it is recommended the monitor be returned to CAS Medical Systems for service.

PNEUMATIC PRESSURE CHECKS

PLUG TUBE

Obtain the male luer plug found in the Calibration Kit (product #P9) supplied with the monitor.

Place this plug into the cuff connector at the end of the monitor inflation hose and twist one-quarter turn. The plug must fit securely into the connector for this test to be performed properly.

Enter the Test Mode. The Message Window will briefly display "TEST MODE" followed by "0 mmHg".

Press the START pushbutton to begin the Pressure Check.

The Message Window will display "Chk Prs", will inflate to approximately 180 mmHg and attempt to hold this pressure. The pressure value will be displayed in the SYSTOLIC display window. This test takes about fifteen (15) seconds.

At the completion of a successful Pressure Check, the Message Window will display "Passed"; the monitor will beep two (2) times and will return to the Calibration Check function after five (5) seconds.

If the monitor fails the Pressure Check, the Message Window will display "Leak", the monitor will beep three (3) times and the return to the Calibration Check function after five (5) seconds.

Due to the volume differences of the hoses offered with the CAS 740 Monitor, the monitor may incorrectly fail the Plug Tube check. Should the monitor fail the Plug Tube Pressure Check, obtain a 500 ml Pressure Cylinder and follow the 500 ml Pressure Check.

500 ml PRESSURE CHECK

Obtain a fixed volume 500 ml Pressure Cylinder (CAS p/n 01-02-0248).

Place the end of the monitor's inflation hose securely onto the luer fitting at the top of the pressure cylinder. The hose must fit securely onto the connector for this test to be performed properly.

Enter the Test Mode. The Message Window will briefly display "TEST MODE" followed by "0 mmHg".

Press the START pushbutton to begin the Pressure Check.

The Message Window will display "Chk Prs", will inflate to approximately 160 mmHg and attempt to hold this pressure. The pressure value will be displayed in the SYSTOLIC display window. This test takes about fifteen (15) seconds.

At the completion of a successful Pressure Check, the Message Window will display "Passed", the monitor will beep two (2) times and will return to the Calibration Check function after five (5) seconds.

If the monitor fails the Pressure Check, the Message Window will display "Leak", the monitor will beep three (3) times and the return to the Calibration Check function after five (5) seconds.

Should the monitor fail the 500 ml Pressure Check, it is recommended the monitor be returned to CAS Medical Systems for service.

NIBP SIMULATOR CHECK

Exit the Test Mode and connect the CAS 740 Monitor to a NIBP Simulator.

Set the simulator to a pressure value of 120/80, 40 bpm, 15% gain.

Press the START pushbutton and allow the monitor to take the NIBP measurement.

Verify the NIBP values, displayed on the monitor's front panel, to be within ± 5 mmHg and the Pulse Rate to be within $\pm 2\%$ or ± 2 bpm, whichever is greater.

TEMPERATURE CALIBRATION CHECK

To perform a Temperature Calibration Check, obtain a Calibration Key. This key can be purchased directly from Welch Allyn or CAS Medical Systems. Refer to the SPARE PARTS section for part number information.

The Temperature Calibration Check can be performed, at any time, once the monitor enters the Configuration Mode.

To enter the monitor Configuration Mode, depress and hold the AUDIO and ALARM LIMITS pushbutton keys while the monitor is being turned "ON".

- 1) Remove the temperature probe and its connector completely from the monitor and insert the Calibration Key.
- 2) Re-insert and remove the temperature probe from the probe guide to reset the thermometer's electronics.
- 3) Wait for the test to complete, and observe the display reading in the TEMP display window.
- 4) The display value should read $36.3 \pm 0.1^{\circ}\text{C}$ or $97.3 \pm 0.1^{\circ}\text{F}$.

NOTE:

The monitor will display the Temperature Calibration Key value using the current temperature units selected.

NOTE:

The Temperature Calibration Key will only operate while the monitor is in the Configuration Mode. If the Calibration Key is inserted during normal monitoring, the TEMP display will show three (3) flashing dashes "- - -" and no value will be displayed.

- 5) Remove the Calibration Key and re-insert the temperature probe connector.
- 6) Install the temperature probe into the probe holder.

OXIMETRY CALIBRATION CHECK

The oximeter is factory calibrated to determine the percentage of arterial oxygen saturation of functional hemoglobin. No user calibration is required.

SpO₂ SIMULATOR CHECK

Exit the Test Mode and connect the CAS 740 Monitor to a SpO₂ Simulator of the appropriate type.

Set the simulator to a SpO₂ value of 98% and a Pulse Rate of 60 bpm.

Verify the %SpO₂ reading, displayed on the monitor's front panel, to be within +/- 2% digits and the Pulse Rate to be within +/- 3 bpm.

ELECTRICAL SAFETY CHECKS

WARNING:

DO NOT touch the monitor when performing these tests.

LEAKAGE

Disconnect all accessories from the monitor.

Plug the AC power cord from the CAS 740 Monitor into the Electrical Safety Analyzer.

Turn the CAS 740 Monitor "ON".

Perform a Leakage Check per manufacturers instructions. Verify the monitor's leakage to be less than 100 micro-amps.

HYPOT (Monitor)

NOTE:

CAS Medical Systems recommends a Hypot Electrical Safety Checks be performed each time the monitor's case is opened or patient isolation is in question.

WARNING:

DO NOT touch the monitor when performing this test.

Disconnect all accessories from the monitor.

Plug the AC power cord from the CAS 740 Monitor into the Hypot Tester.

WARNING:

DO NOT turn the monitor "ON" during a hypot test.

Perform a Hypot Test, per manufacturers instructions for **one (1) minute**, at 2.5 KV.

Verify that there was no arching observed.

HYPOT (SpO₂)

WARNING:

DO NOT touch the monitor when performing this test.

Connect the appropriate SpO₂ probe and/or cable to the monitor.

Plug the AC power cord from the CAS 740 Monitor into the Hypot Tester.

Connect a lead wire from the Ground terminal of the Hypot tester to the SpO₂ probe.

WARNING:

DO NOT turn the monitor "ON" during a hypot test.

Perform a Hypot Test, per manufacturers instructions for **one (1) second**, at 1.8 KV.

Verify that there was no arching observed.

Disconnect the monitor from the test equipment.

This concludes the testing to the CAS 740 Monitor.

DATA SHEET

Date: _____

Tested By: _____

**CAS 740 Monitor
Data Sheet**

Dealer / Hospital: _____

Monitor Type: _____

Address: _____

Monitor Serial Number: _____

City: _____

State: _____ Zip: _____

Battery Charge

Verify, the Battery Power Visual Indicator is lit.

Pass () Fail ()

Turning the CAS 740 Monitor “ON”

Monitor displays Configuration for one second.

Pass () Fail ()

All equipment parameters are lit for one second.

Pass () Fail ()

All High Alarm values are displayed for one second, an audio tone is heard and the message “Hi Lims” is displayed in the Message Window.

Pass () Fail ()

All Low Alarm values are displayed for one second, an audio tone is heard and the message “Lo Lims” is displayed in the Message Window.

Pass () Fail ()

The monitor’s current time is displayed for one second.

Pass () Fail ()

Displaying the Time

Verify, the monitor’s Time is set correctly.

Pass () Fail ()

Alarm Audio

Verify, the Alarm Volume can be adjusted to one of five levels.

Pass () Fail ()

SpO₂ AudioVerify, the SpO₂ Volume can be adjusted to one of five levels.

Pass () Fail ()

LED Check

Verify, all front panel LED displays and visual indicators are lit.

Pass () Fail ()

+12 Volt Power Supply Check

Verify, the voltage reading to be 12 +/- 0.50.

Pass () Fail ()

System Pressure

Inflate system pressure to 200mmHg.

Pass () Fail ()

Deflate system pressure to 0 mmHg.

Pass () Fail ()

Inflate system pressure to 50 mmHg.

Pass () Fail ()

Inflate system pressure to 100 mmHg.

Pass () Fail ()

Inflate system pressure to 150 mmHg.

Pass () Fail ()

Inflate system pressure to 200 mmHg.

Pass () Fail ()

Over Pressure

Verify, the Message Window displays "Over Pres".

Pass () Fail ()

Pneumatic Pressure Tests

Plug Tube Test

Pass () Fail ()

500 mL Pressure Check

Pass () Fail ()

NIBP Simulator Check

Monitor displays correct NIBP values.

Pass () Fail ()

Temperature Calibration Check

Monitor displays correct Temperature value.

Pass () Fail ()

Oximetry Simulator Check

Monitor displays correct SpO₂ values.

Pass () Fail ()

Leakage

Verify, the monitor's leakage to be less than 100 micro-amps.

Pass () Fail ()

Hypot

Monitor, verify, no arching was observed.

Pass () Fail ()

SpO₂, verify, no arching was observed.

Pass () Fail ()

12. SERVICE PROCEDURES

INTRODUCTION

CAUTION:

Removal of the "Warranty Void If Removed" sticker voids any warranty the monitor may have. Refer service only to technicians trained by CAS Medical Systems Inc.

This section discusses the replacement of major assemblies found inside the CAS 740 Monitor.

WARNING:

Before attempting to open or disassemble the CAS 740 Monitor, disconnect the power cord from the monitor and remove the battery.

CAUTION:

Observe ESD (electrostatic discharge) precautions when working within the unit.

TOOLS REQUIRED

- Small, Phillips head screwdriver
- Medium, Phillips head screwdriver
- Flat blade, screwdriver
- Household scissors
- Torque screwdriver
- Adhesive, Loctite 425
- Adhesive, RTV, GE 162 (Electronic Grade)
- 91% Isopropyl Alcohol

REPLACING THE MONITOR BATTERY

A part number for the battery can be found on the label located on the inside panel of the battery pack. When the battery fails to hold a charge it will need to be replaced.

CAS Medical Systems recommends the battery be changed every two (2) years.

REMOVING THE BATTERY

- 1) Turn the monitor "OFF" and disconnect the power cord.
- 2) Push down on the battery latch to unlock the battery door from the rear panel of the monitor.
- 3) Carefully remove the battery pack from the rear panel of the monitor. Refer to Figure 13.

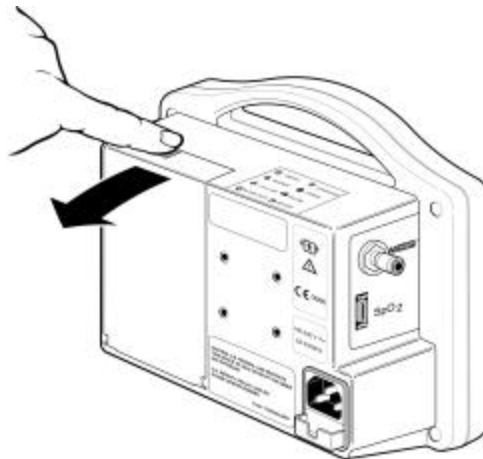


Figure 13: Removing the Battery

INSTALLING THE BATTERY

- 1) Align the Battery Pack guides with the bottom of the monitor.
- 2) Slowly close the battery door to ensure the connector in the monitor and the connector on the battery pack mate together.
- 3) Lock the battery door closed.

NOTE:

When the battery pack is re-installed, the monitor will automatically turn "ON".

WARNING:

DO NOT disassemble the battery pack or batteries. The batteries contain electrolytes, which can cause injury to eyes, skin and clothing.

NOTE:

This product contains a rechargeable battery that is recyclable. Under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream. Check with your local authorities for instructions on recycling options in your area.

CHANGING THE FUSES

CAS 740

The CAS 740 Monitor uses a dual fuse power input receptacle. The receptacle incorporates fuses in the hot and neutral AC input lines that are user serviceable.

The two (2) fuses for the CAS 740 Monitor are each rated at 250V, 500mA, 5 x 20 mm, Slow Blow. Refer to Section 14, SPARE PARTS for part number information.

CAUTION:

For continued protection against fire hazard, replace only with identically rated fuses.

A fuse may need to be replaced if the monitor is plugged into an electrical outlet but the Battery Power Visual Indicator is not illuminated.

WARNING:

Before changing the fuse, unplug the monitor's power cord.

The fuse holder is incorporated into the power input receptacle and located under the power cord input connector.

To replace fuses:

- 1) Turn the monitor "OFF" and disconnect the power cord.
- 2) Depress down on the locking tab, which holds the fuse holder in the power input receptacle.
- 3) While holding down on the tab, pull the fuse holder out.
- 4) Remove the fuses.
- 5) Place new fuses directly into the fuse holder.
- 6) Insert the fuse holder into the power input receptacle. There should be an audible "click" when it is secure.

CAS 740M

The CAS 740M Monitor uses a single fuse located inside the monitor on the DC-DC Converter Board.

The one (1) fuse for the CAS 740M Monitor is rated at 125VAC, 3.15A, Time Lag. Refer to Section 14, SPARE PARTS for part number information.

CAUTION:

For continued protection against fire hazard, replace only with identically rated fuses.

A fuse may need to be replaced if the monitor is plugged into an electrical outlet but the Battery Power Visual Indicator is not illuminated.

WARNING:

Before changing the fuse, disconnect the monitor from its power source.

To replace the fuse:

- 1) Turn the monitor "OFF" and disconnect it from its power source.
- 2) Complete the steps in sections *Prior to Disassembly* and *Monitor Disassembly* (below).
- 3) Remove and replace the defective fuse from the DC-DC Converter Board. NOTE: The board will be attached to the monitor's rear case assembly.
- 4) Secure the fuse in place by placing a bead of silicon RTV adhesive around the fuse.
- 5) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

MAIN MONITOR SERVICE PROCEDURES

PRIOR TO DISASSEMBLY

- 1) Turn the CAS 740 Monitor "OFF" by pressing the front panel ON/OFF (STANDBY) pushbutton.
- 2) Disconnect the monitor from the AC or DC power source.
- 3) Remove the battery from the monitor.

MONITOR DISASSEMBLY

- 1) Complete the steps in *Prior to Disassembly*.
- 2) Set the CAS 740 Monitor face down onto a soft surface being careful not to scratch the front display.
- 3) If your monitor is equipped with either a Temperature Module or a RS232/Nurse Call Module, remove the one (1) screw that secures the module to the monitor's rear case. Remove the Module and place it to the side.
- 4) Remove the four (4) corner screws that secure the two case halves together.
- 5) Separate the monitor's front and rear cases, being careful not to stress the internal wire harnesses.
- 6) Disconnect the cable connectors from J1 and J2 on the Main Control Board.
- 7) Place the Rear panel assembly down next to the Front panel assembly.

MONITOR ASSEMBLY

- 1) Connect the Supply harness assembly to J1 on the Main Control Board.
- 2) Connect the Battery harness assembly to J2 on the Main Control Board.
- 3) Place the Rear Case assembly onto the Front Case assembly being careful of all wire harnesses and hoses.
- 4) Secure the two case halves together using the four (4) screws previously removed.
- 5) Re-install the module and secure it to the monitor's rear case using the Loctite adhesive and the one (1) screw previously removed. Apply a small amount of the adhesive to the threads of the screw and torque to 32 in.-oz.
- 6) Perform a complete System Check as described in the section *MAINTENANCE PROCEDURES*.

REPLACING THE POWER SUPPLY MODULE

The Power Supply Module is part of the Rear Case Assembly.

Removal

- 1) Complete the steps in *Prior to Disassembly and Monitor Disassembly*.
- 2) Disconnect the two (2) harness assemblies from the Power Supply Module.
- 3) Remove the four (4) screws that secure the module to the rear case.
- 4) Remove the defective Power Supply Module.

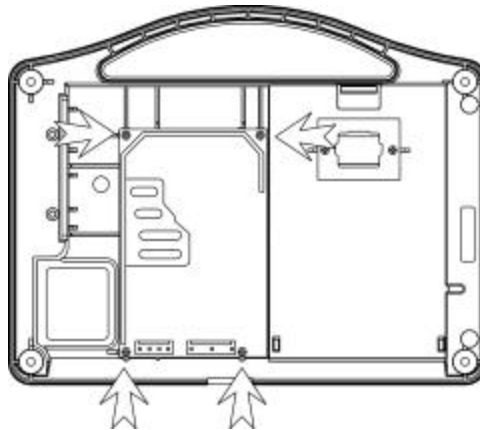


Figure 14: Replacing the Power Supply Module

Installation

- 1) Install the Power Supply module into the rear case so that the connectors on the Power Supply Module are at the bottom of the monitor's rear case.
- 2) Secure the Power Supply module using the hardware previously removed.
- 3) Re-connect the wire harness from the AC input receptacle.
- 4) Re-connect the wire harness that will be connected to the J1 connector on the Main Control Board.
- 5) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE NIBP MODULE

The NIBP Module is part of the Front Case Assembly.

Removal

- 1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
- 2) Disconnect the NIBP hose from the NIBP connector located on the side panel. Note the location of the hose from the connector to the board.
- 3) Remove the three (3) screws that secure the NIBP Module.
- 4) Separate the NIBP Module from the J4 connector located on the Main Control board.

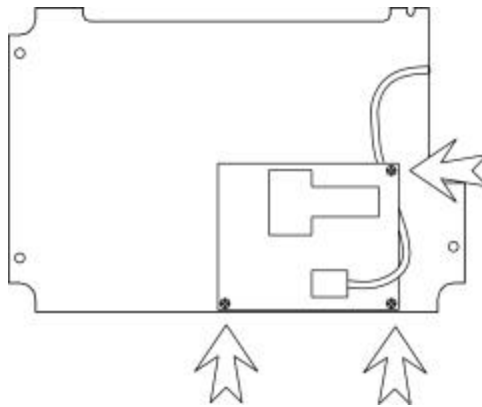


Figure 15: Replacing the NIBP Module

Installation

- 1) Align the female connector on the NIBP Module with the J4 connector on the Main Control board. Gently push the NIBP Module onto the connector pins.
- 2) Secure the board to the standoffs using the Loctite adhesive and the hardware previously removed. Apply a small amount of the adhesive to the threads of the screws and torque to 30 in.-oz.
- 3) Re-route the hose under the board and connect it to the NIBP connector on the side panel.
- 4) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE SpO₂ MODULE

The SpO₂ Module is part of the Front Case Assembly.

Removal

- 1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
- 2) Disconnect the cable assembly from the SpO₂ board to the Main Control board.
- 3) Disconnect the cable assembly from the side panel input connector to the SpO₂ board.
- 4) Remove the three (3) screws used to secure the SpO₂ board to the Main Control board standoffs. Remove the board.
- 5) Nonin SpO₂ – Remove the Nonin SpO₂ board from the Interface board by gently lifting the PCB from the four (4) nylon standoff support posts while pinching together the prong tips. Separate the SpO₂ board from the J2 connector located on the Interface board.

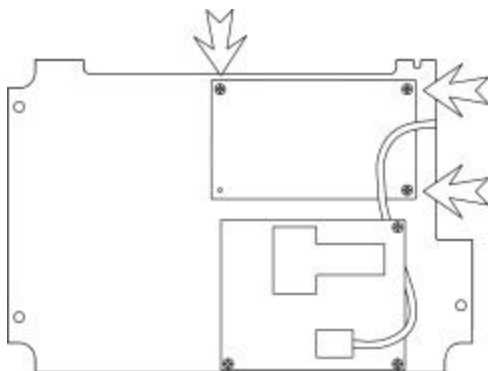


Figure 16: Replacing the SpO₂ Module

Installation

- 1) Nonin SpO₂ – Align the J2 connector with its mating connector on the SpO₂ module and gently push the SpO₂ board down. Secure the board in place by gently pushing down in the four corners.
- 2) Place the SpO₂ module onto the standoffs located on the Main Control board. Secure the board to the standoffs using the Loctite adhesive and the hardware previously removed. Apply a small amount of the adhesive to the threads of the screws and torque to 30 in.-oz.
- 3) Connect the harness assembly from the side panel input connector.
- 4) Connect the harness assembly from the Main Control board.
- 5) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE TEMPERATURE MODULE

The Temperature Module is part of the Front Case Assembly.

Removal

- 1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
- 2) Remove the Temperature Module by gently lifting the PCB from the four (4) nylon standoff support posts while pinching together the prong tips.
- 3) Separate the Temperature Module from the J8 and J9 connectors located on the Main Control board.

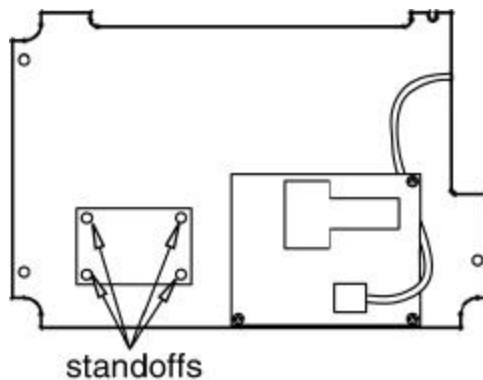


Figure 17: Replacing the Temperature Module

Installation

- 1) Align the 12 pin male connector (J9) and 13 pin male connector (J8) with their mating connectors on the Temperature board and gently push the Temperature board down.
- 2) Secure the board in place by gently pushing down in the four (4) corners.
- 3) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE MAIN CONTROL BOARD

The Main Control board is part of the Front Case Assembly.

Removal

- 1) Complete the steps in *Prior to Disassembly and Monitor Disassembly*.
- 2) Complete the steps in *Replacing the NIBP module* to remove the NIBP module.
- 3) Complete the steps in *Replacing the SpO₂ Module* to remove the SpO₂ module.
- 4) Complete the steps in *Replacing the Temperature Module* to remove the Temperature module.
- 5) Remove the four (4) screws that secure the Main Control board to the Front Case.
- 6) Fold the Main Control board out from the Front Case and remove the ribbon cable from the J6 Front Panel Keyswitch connector. Remove the board.
- 7) Remove the Display Shield from over the LED displays on the Control Board.

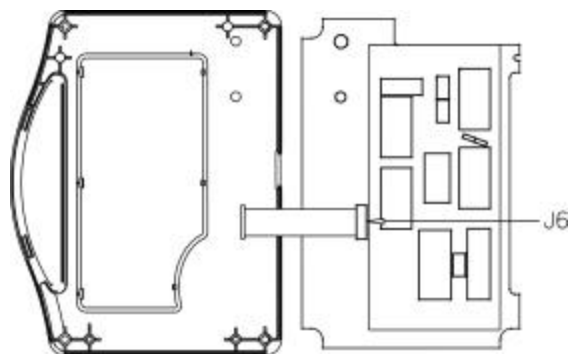


Figure 18: Replacing the Main Control Board

Installation

- 1) Place the Display Shield over the LED displays.
- 2) Adhere the appropriate labels to the LED displays (ADULT, NEO, TEMP).
- 3) Install the ribbon cable, from the front panel Keyswitch, into the J6 connector.
- 4) Fold the Main Control Board assembly over onto the Front Case.

NOTE:

Ensure the Display Window is free of dust and scratches before assembly.

NOTE:

Be careful not to crimp the ribbon cable between the PC Board and the Front Case.

- 5) Secure the board to the standoffs with the hardware previously removed.
- 6) Re-install the NIBP Board and any remaining option boards previously removed.
- 7) Finish assembling the monitor by following the steps in section *Monitor Assembly*.

REPLACING THE FRONT PANEL KEYSWITCH

The Front Panel Keyswitch is part of the Front Case Assembly.

Removal

- 1) Complete the steps in *Prior to Disassembly* and *Monitor Disassembly*.
- 2) Complete the steps in *Replacing the Main Control Board* to remove the board from the monitor.
- 3) Using the flat blade screwdriver, loosen the keyswitch from the front panel by pushing on the keyswitch from the inside of the front panel in the location where the ribbon cable is located.
- 4) Pry the defective keyswitch loose from the front panel.
- 5) Clean the keyswitch recess surface area of all remaining adhesive with 91% Isopropyl Alcohol.

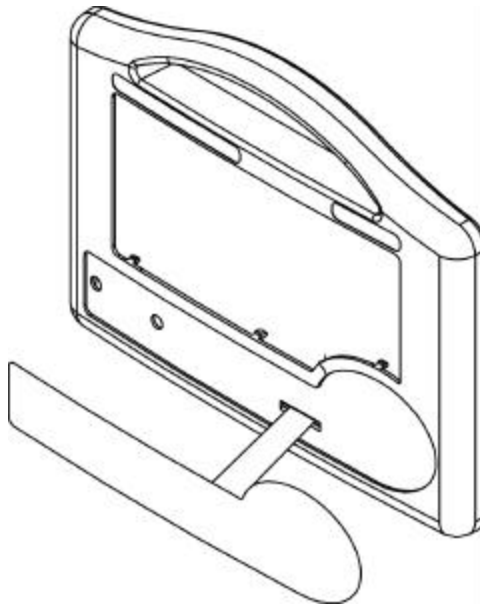


Figure 19: Replacing the Front Panel Membrane Keyswitch

Installation

- 1) Remove the liner from the rear of the keyswitch.
- 2) Feed the ribbon cable through the slot on the Front Panel and carefully position the keyswitch into the recess on the Front Case. Apply even pressure across the face of the keyswitch to secure it in place.

NOTE:

Use extreme caution when handling and positioning the membrane keyswitch. DO NOT bend, crease or pinch the keyswitch or the tail connector. DO NOT remove and reapply the keyswitch.

- 3) Plug the ribbon cable connector into the J6 connector on the Main Control Board.
- 4) Using a pair of household scissors cut back the shield tail flush to the front panel.
- 5) Finish assembling the monitor by following the steps in the Installation section of *Replacing The Main Board*.

MODULE SERVICE PROCEDURES

REPLACING THE RS232/NURSE CALL INTERFACE BOARD

Removal

- 1) Remove the one (1) screw that secures the Module to the monitor's rear case.
- 2) Remove the three (3) screws that secure the RS232/Nurse Call Interface Board to the Module case.
- 3) Remove the board and if necessary, disconnect the cable assembly from the Temperature Interface Board.

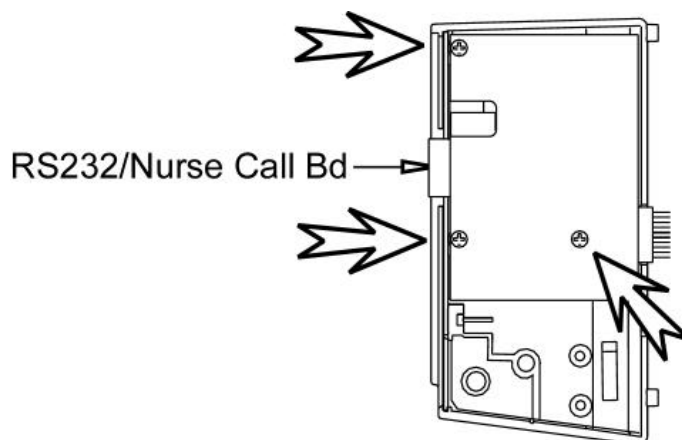


Figure 20: Replacing the RS232/Nurse Call Interface Board

Installation

- 1) If necessary, re-connect the cable assembly from the Temperature Interface Board to J2 on the RS232/Nurse Call Interface Board.
- 2) Install the RS232/Nurse Call Interface Board into the Module case and secure it with the three (3) screws previously removed.
- 3) Re-install the module and secure it to the monitor's rear case using the Loctite adhesive and the one (1) screw previously removed. Apply a small amount of the adhesive to the threads of the screw and torque to 32 in.-oz.
- 4) Perform a complete System Check as described in the section *MAINTENANCE PROCEDURES*.

REPLACING THE TEMPERATURE INTERFACE BOARD

Removal

- 1) Follow the steps as described in the Removal section of *Replacing the RS232/Nurse Call Interface Board*.
- 2) Remove the remaining one (1) screw that secures the Temperature Interface Board to the Module case.
- 3) Remove the board.

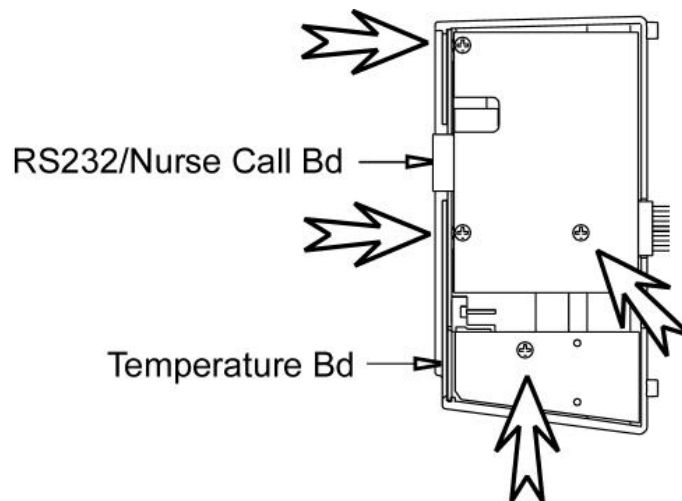


Figure 21: Replacing the Temperature Interface Board

Installation

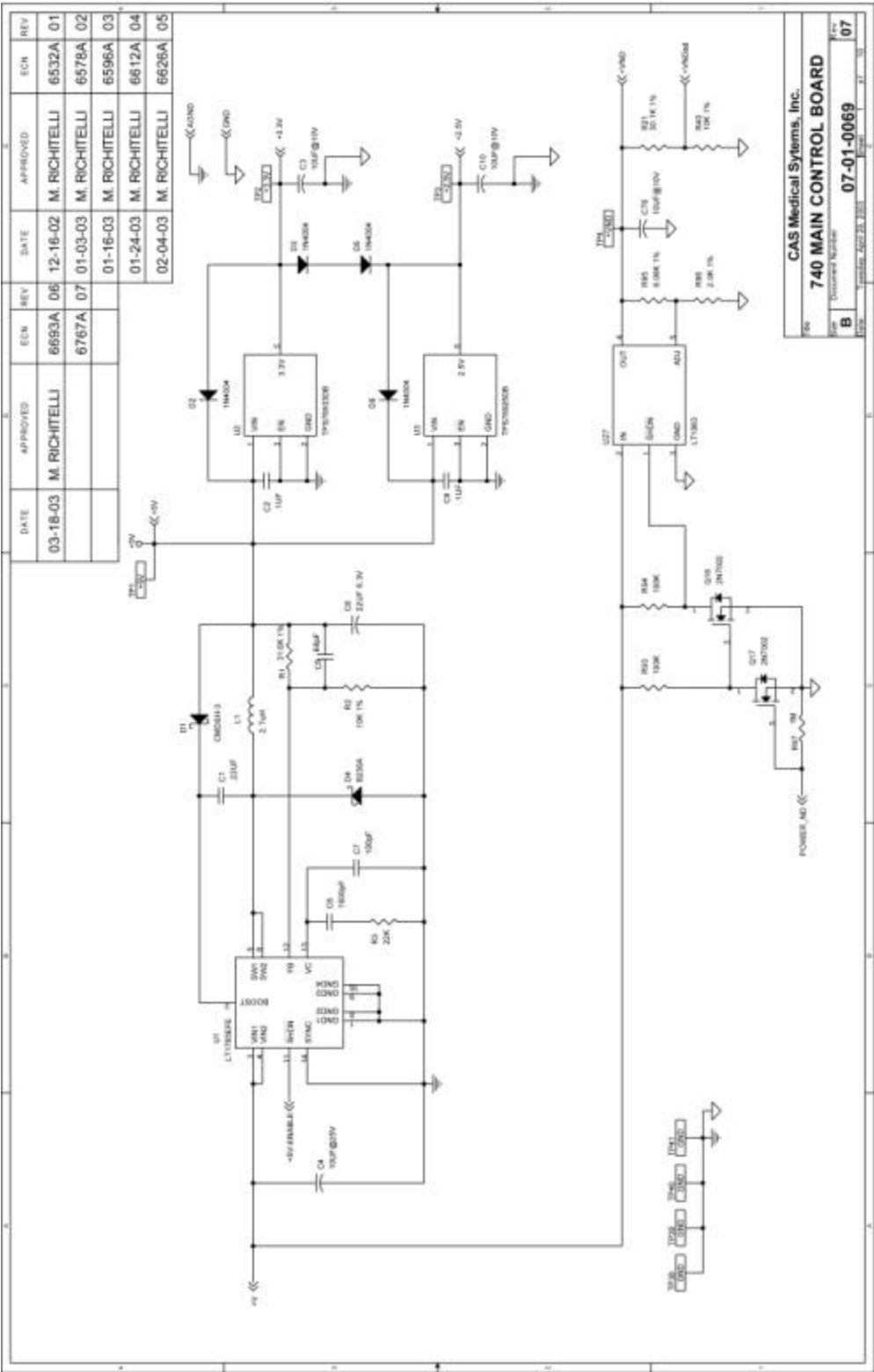
- 1) Install the Temperature Interface Board into the Module case and secure it with the one (1) screw previously removed.
- 2) Finish assembling the Module by following the steps in the Installation section of *Replacing the RS232/Nurse Call Interface Board*.

13. SCHEMATICS

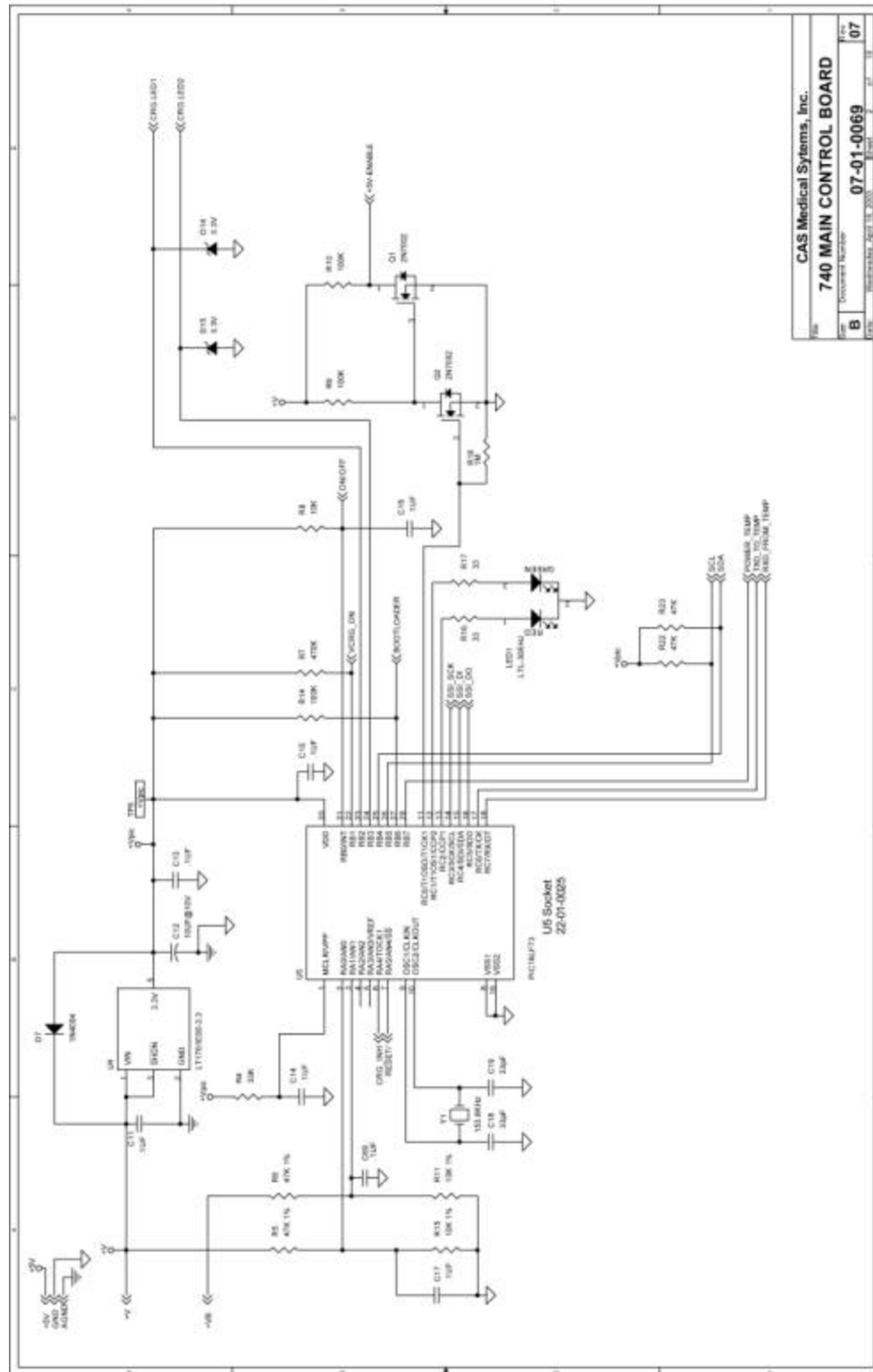
NIBP BOARD

The NIBP Board used in the CAS 740 Monitor is not user serviceable. No schematic diagram is provided.

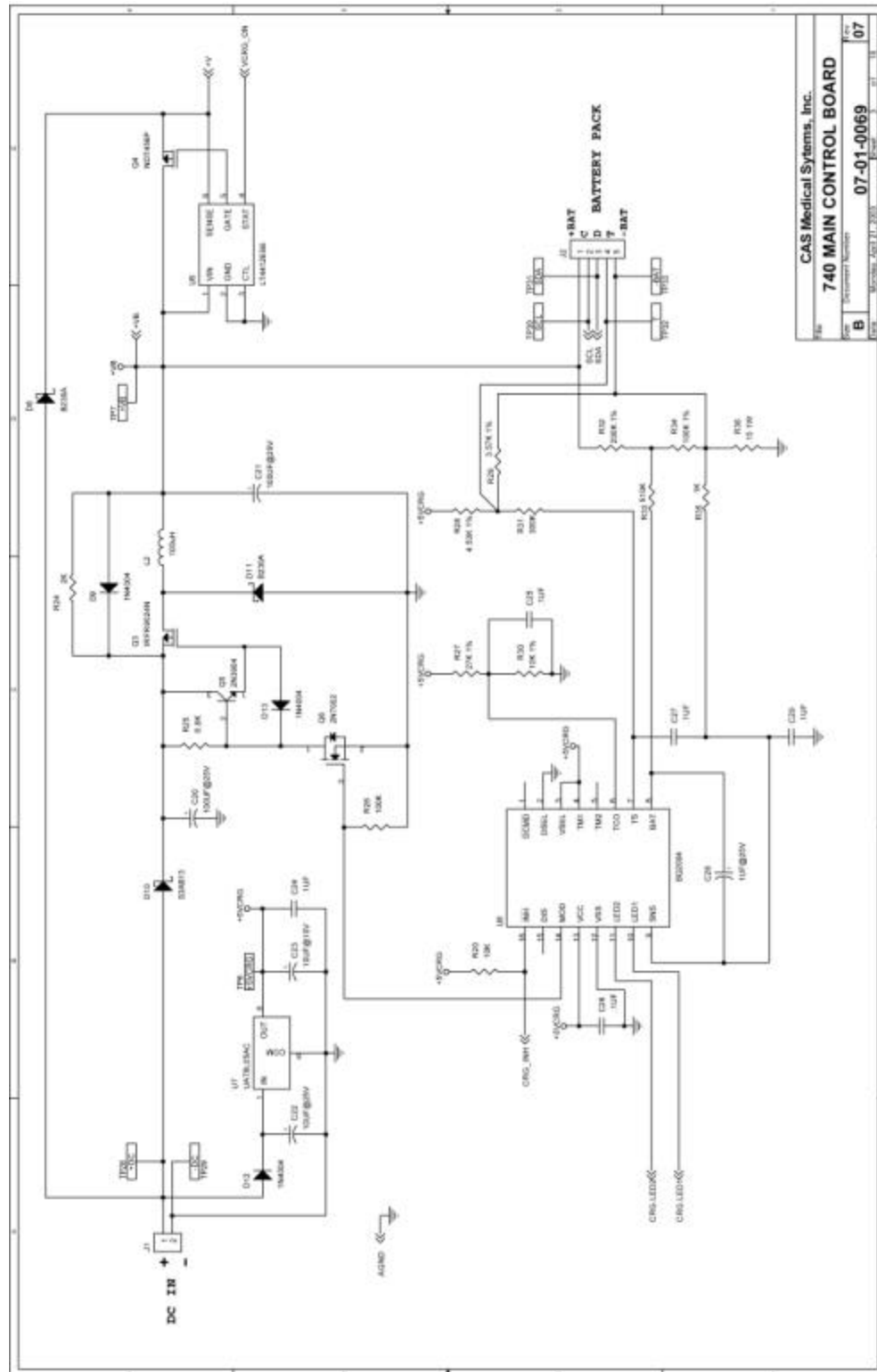
MAIN CONTROL BOARD (PAGE 1 OF 10)



MAIN CONTROL BOARD (PAGE 2 OF 10)

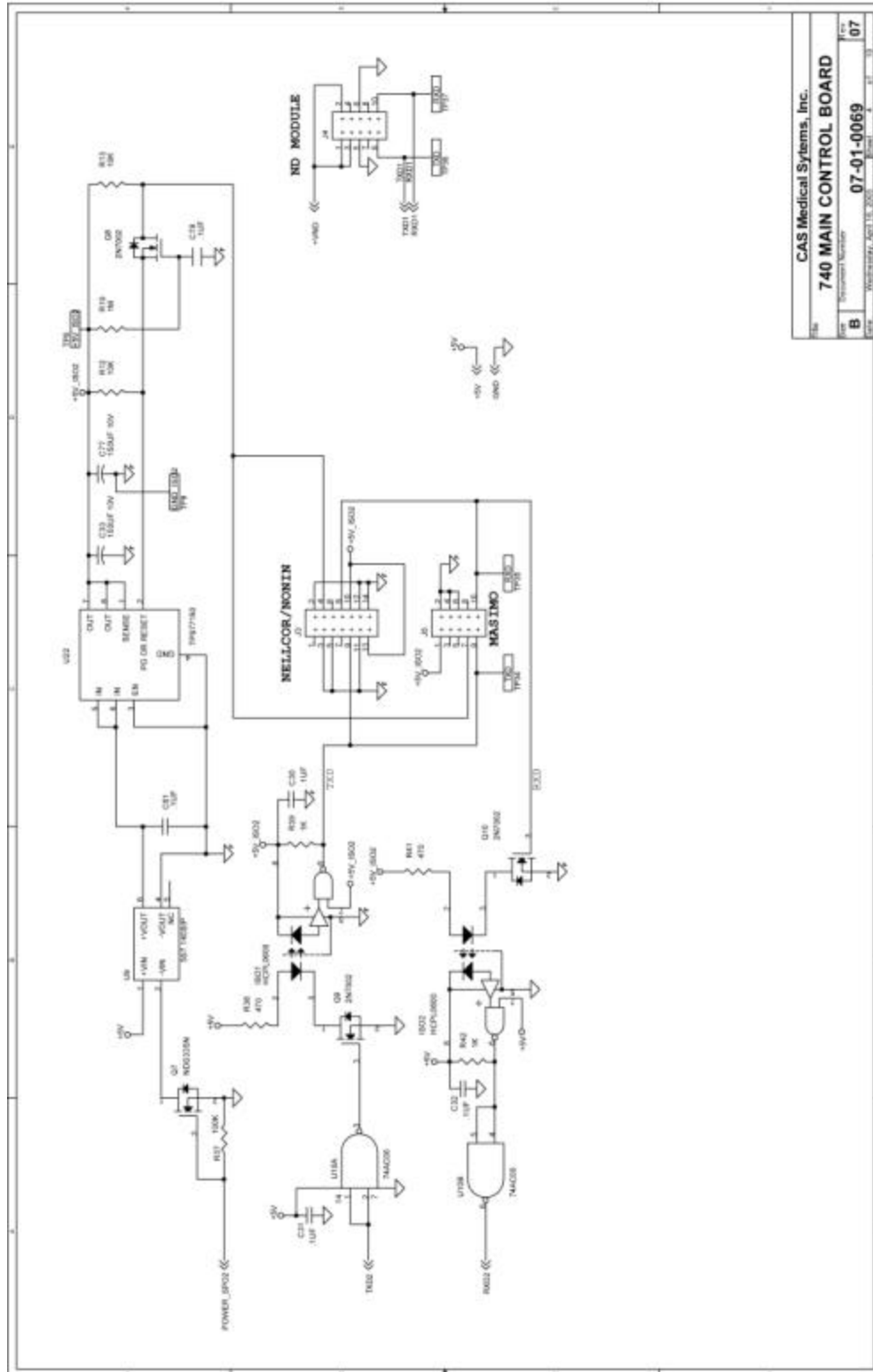


MAIN CONTROL BOARD (PAGE 3 OF 10)



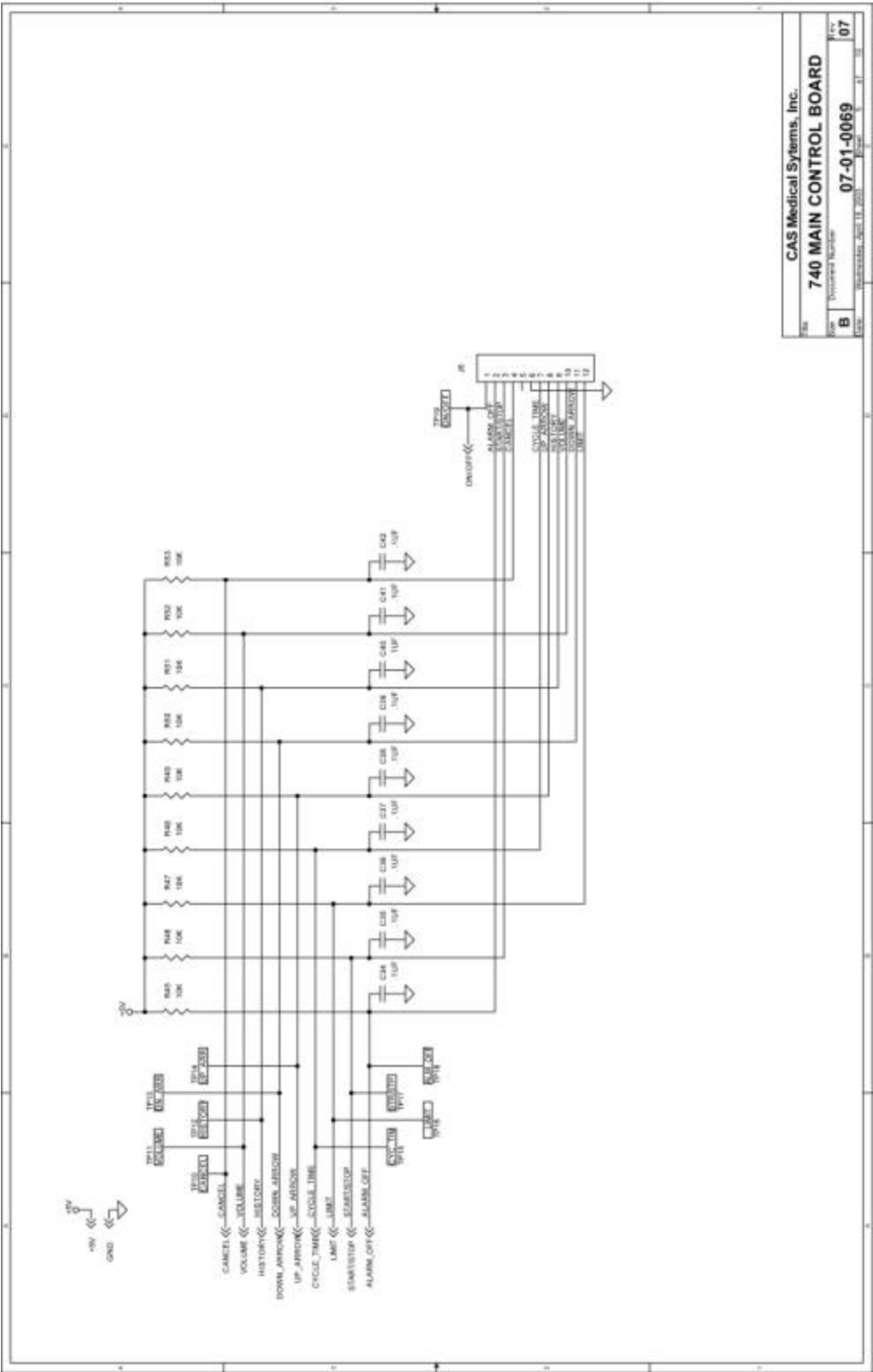
CAS Medical Systems, Inc.	
740 MAIN CONTROL BOARD	
Rev. B	07
Document Number	07-01-0069
Rev. B	07

MAIN CONTROL BOARD (PAGE 4 OF 10)

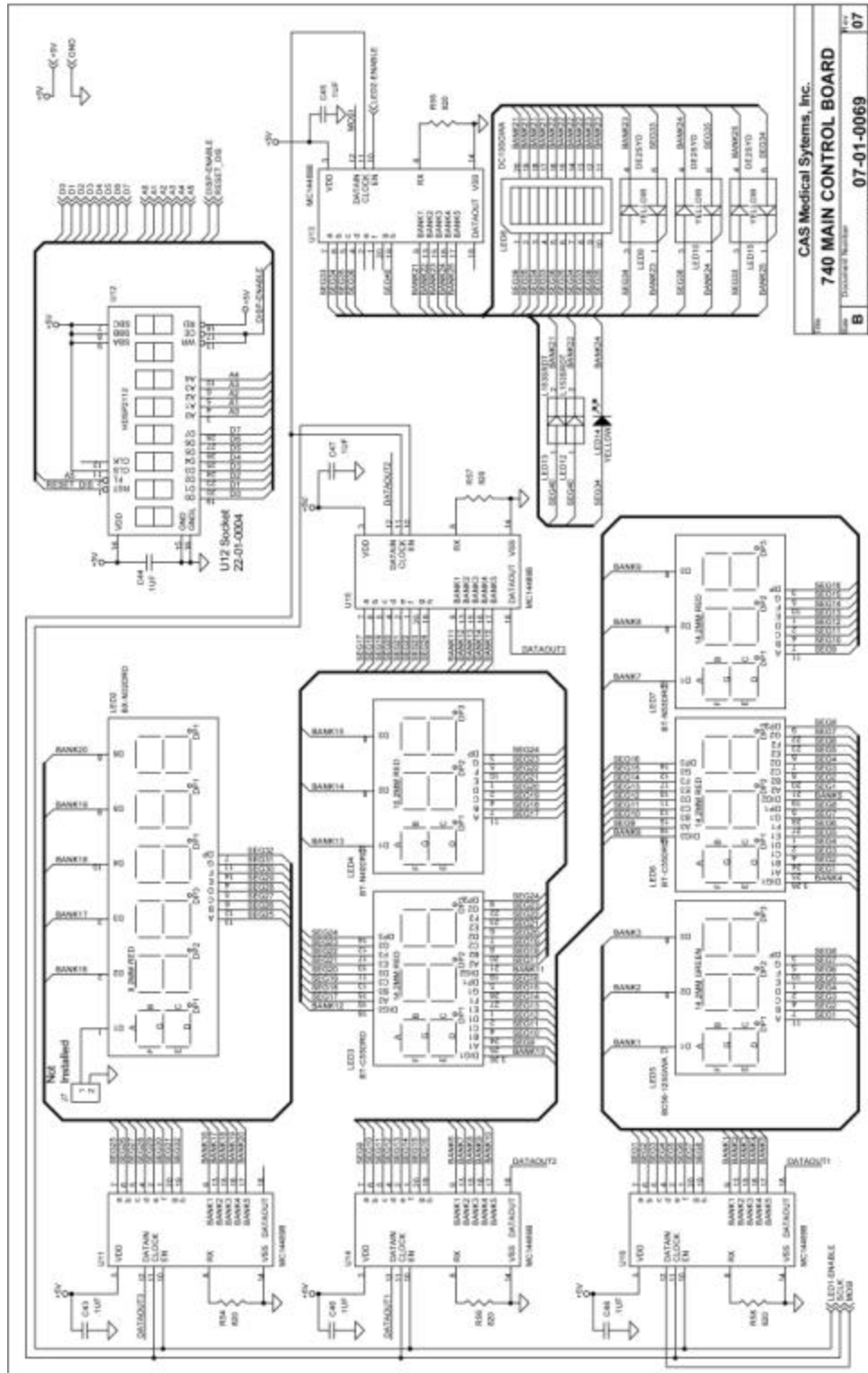


CAS Medical Systems, Inc.			
740 MAIN CONTROL BOARD			
Rev	Document Number	Part Number	Rev
B	07-01-0069	07-01-0069	07

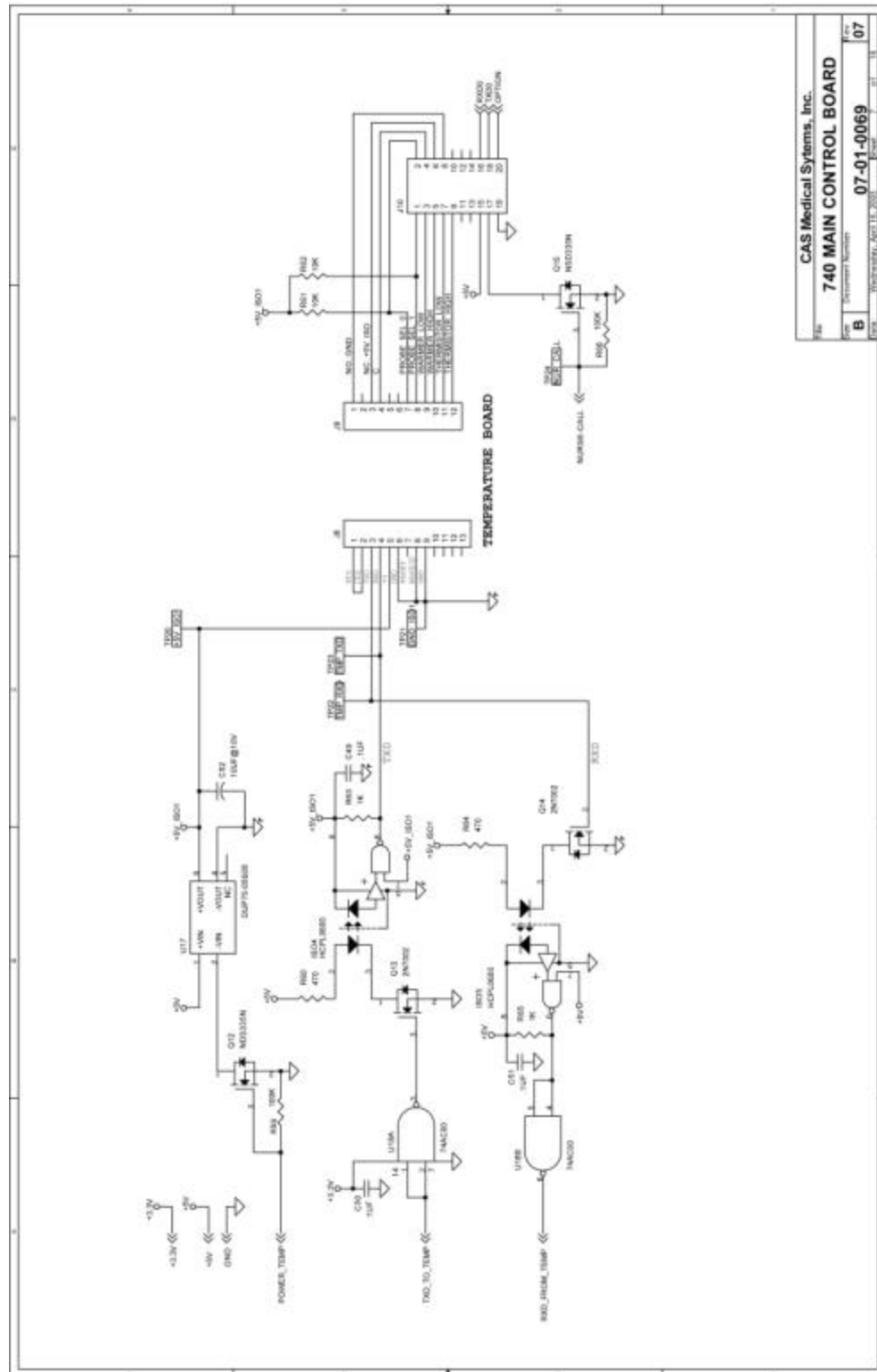
MAIN CONTROL BOARD (PAGE 5 OF 10)



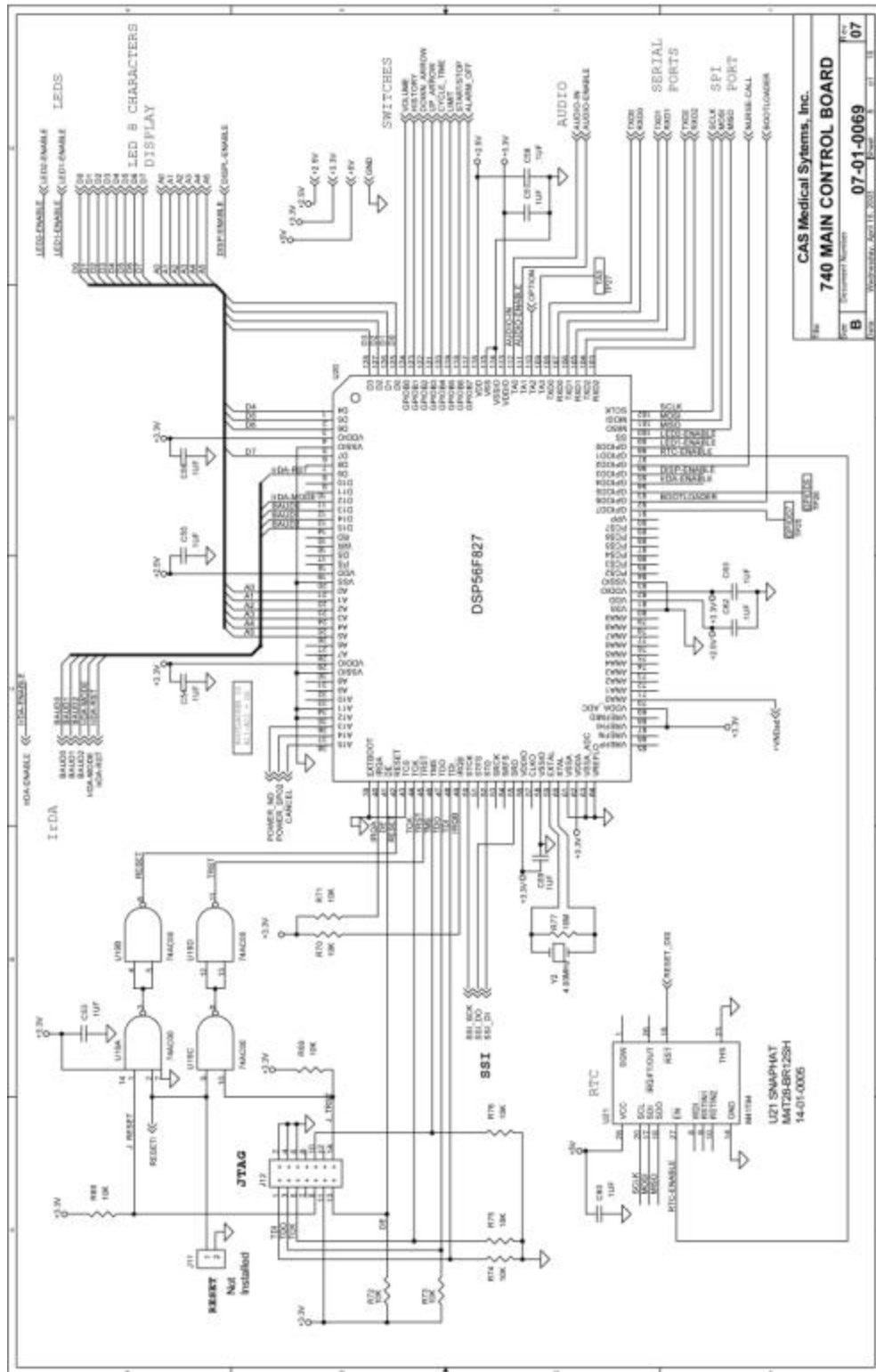
MAIN CONTROL BOARD (PAGE 6 OF 10)



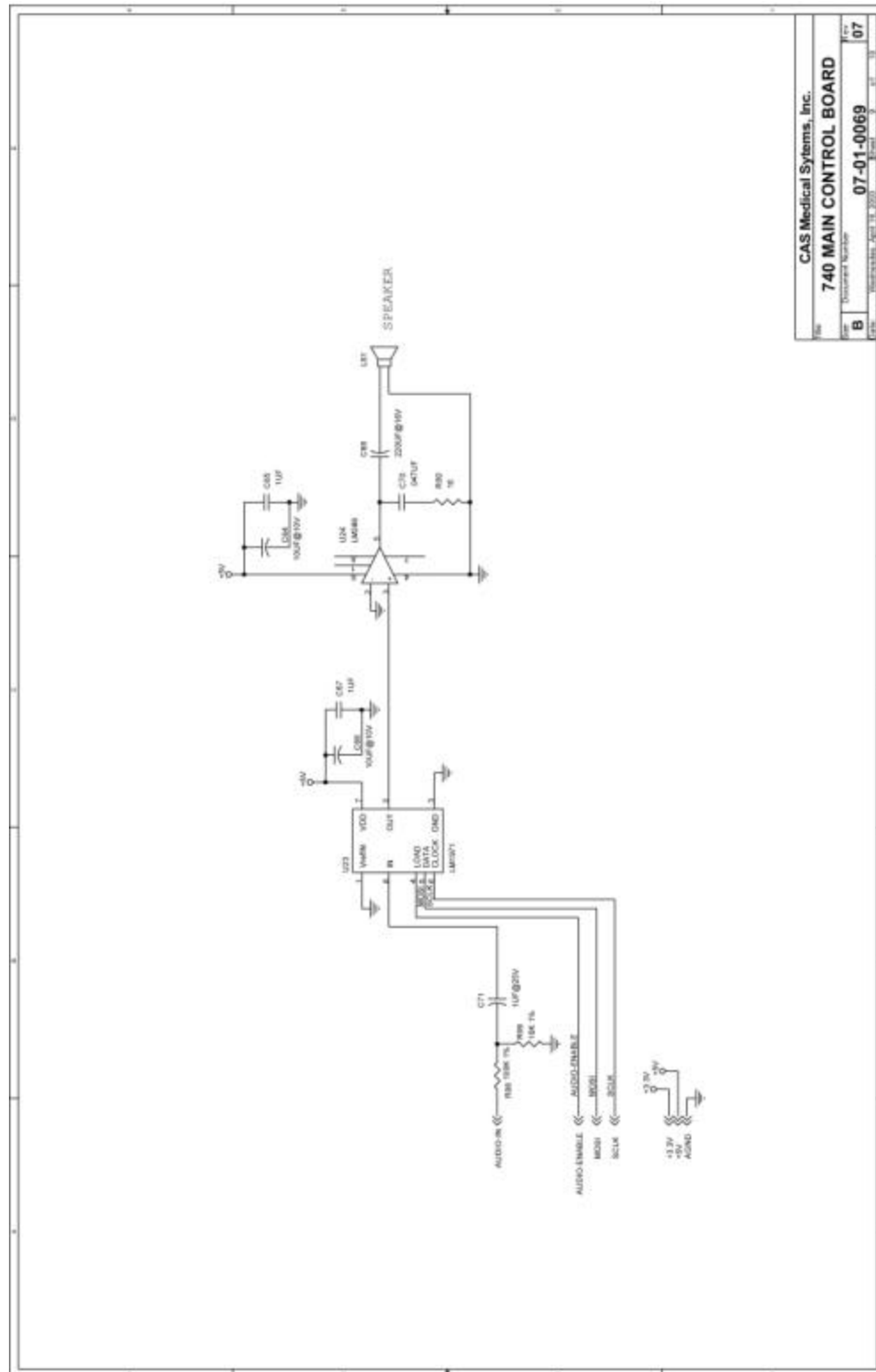
MAIN CONTROL BOARD (PAGE 7 OF 10)



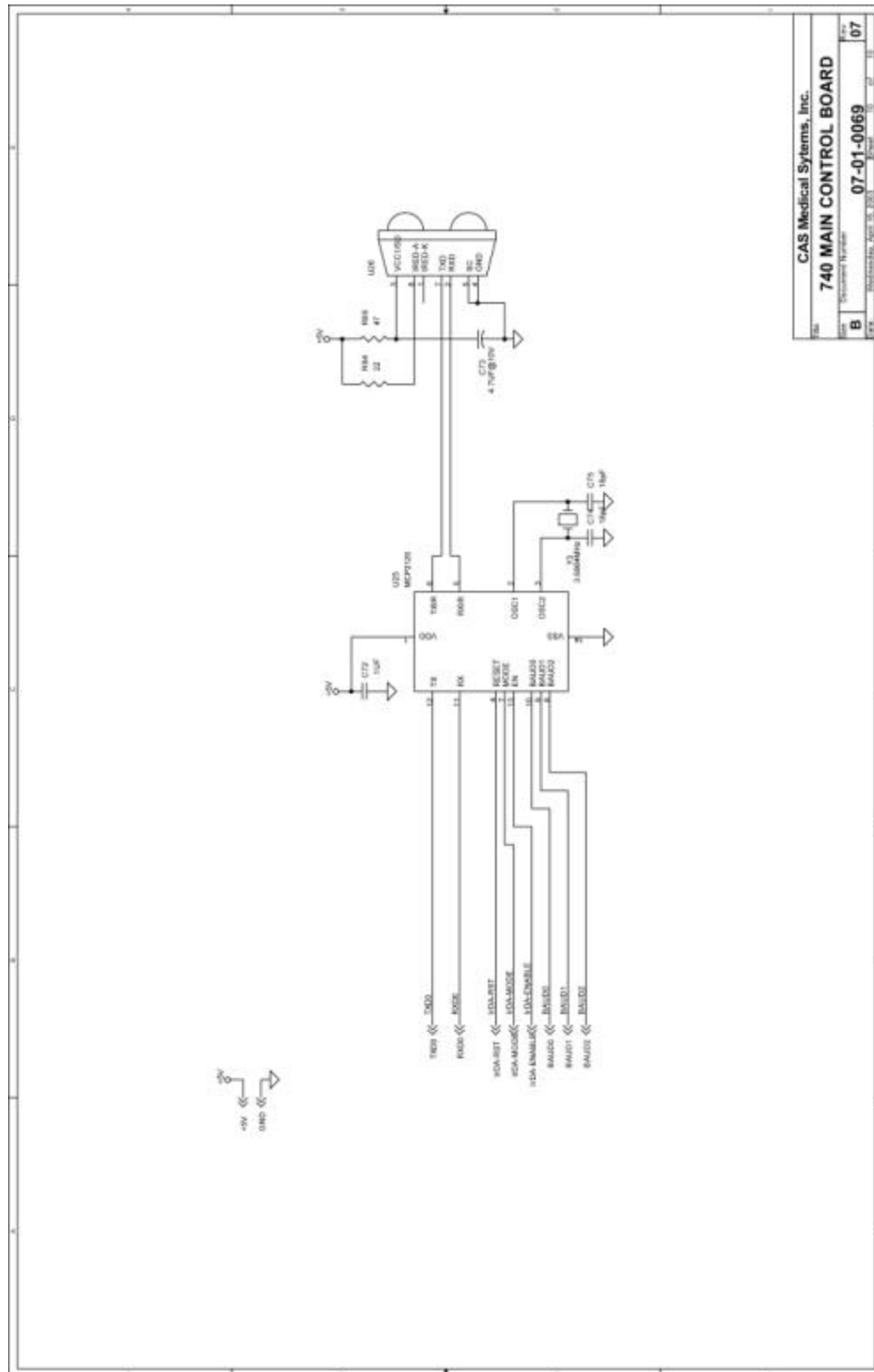
MAIN CONTROL BOARD (PAGE 8 OF 10)



MAIN CONTROL BOARD (PAGE 9 OF 10)

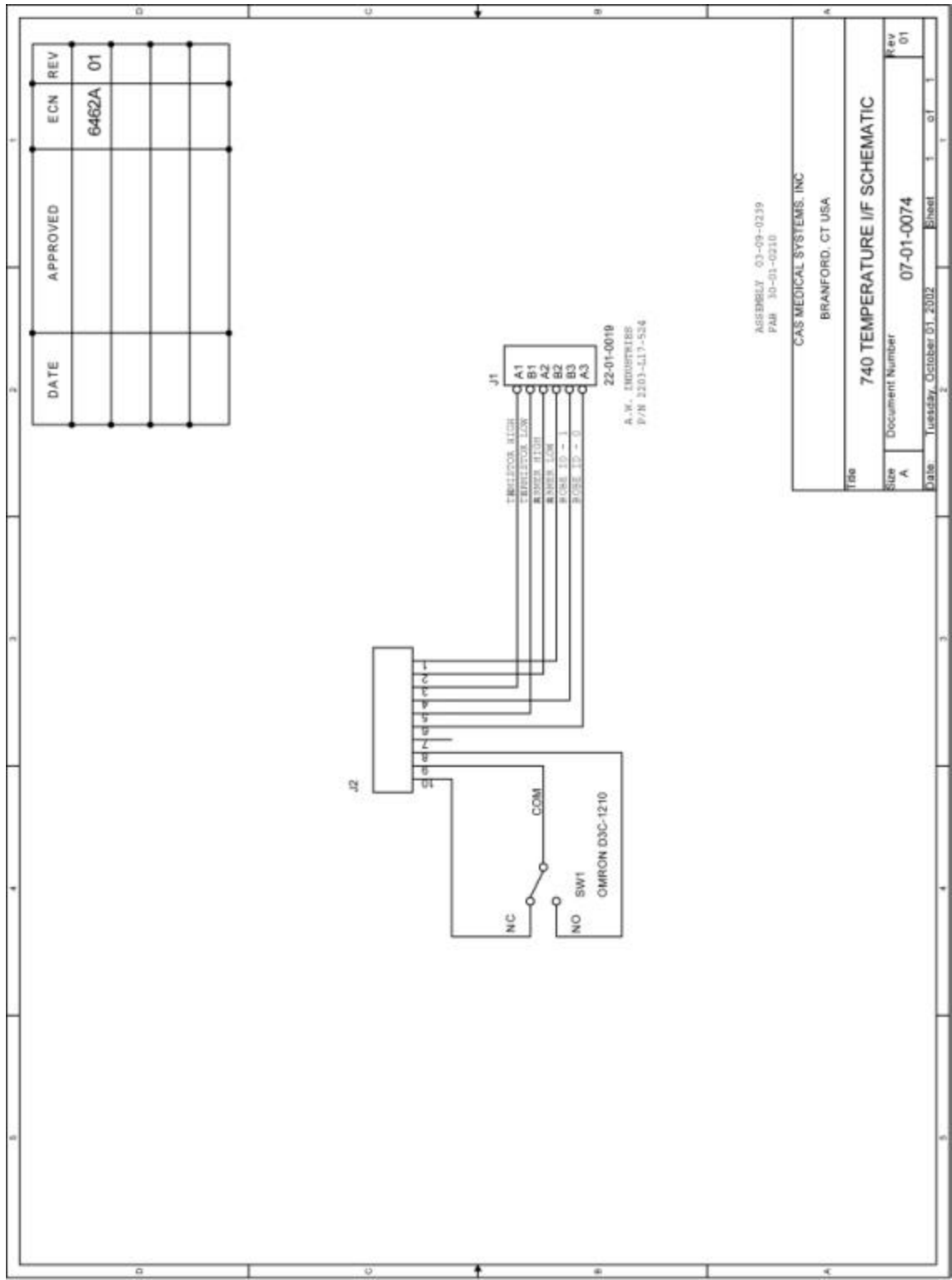


MAIN CONTROL BOARD (PAGE 10 OF 10)

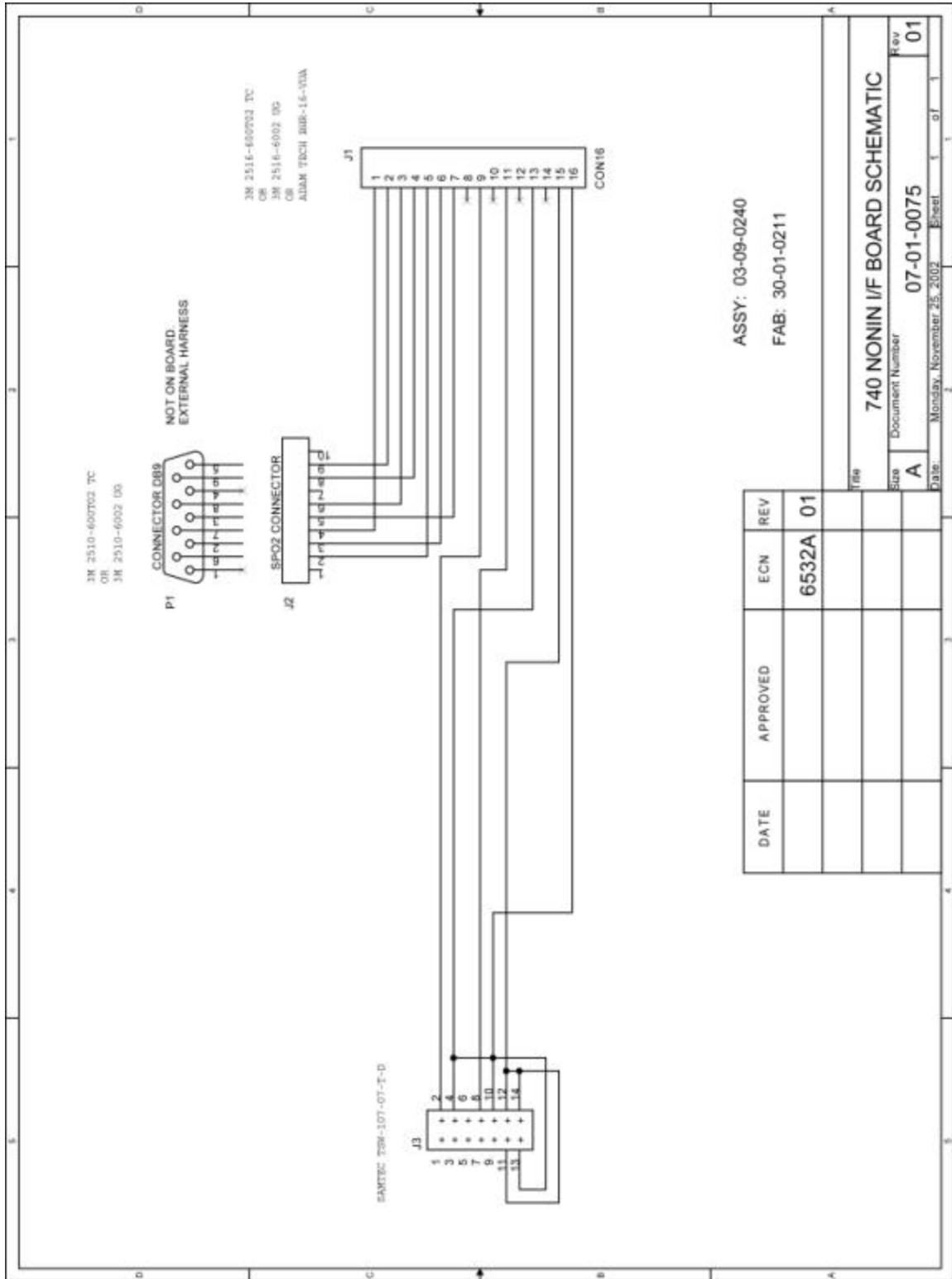


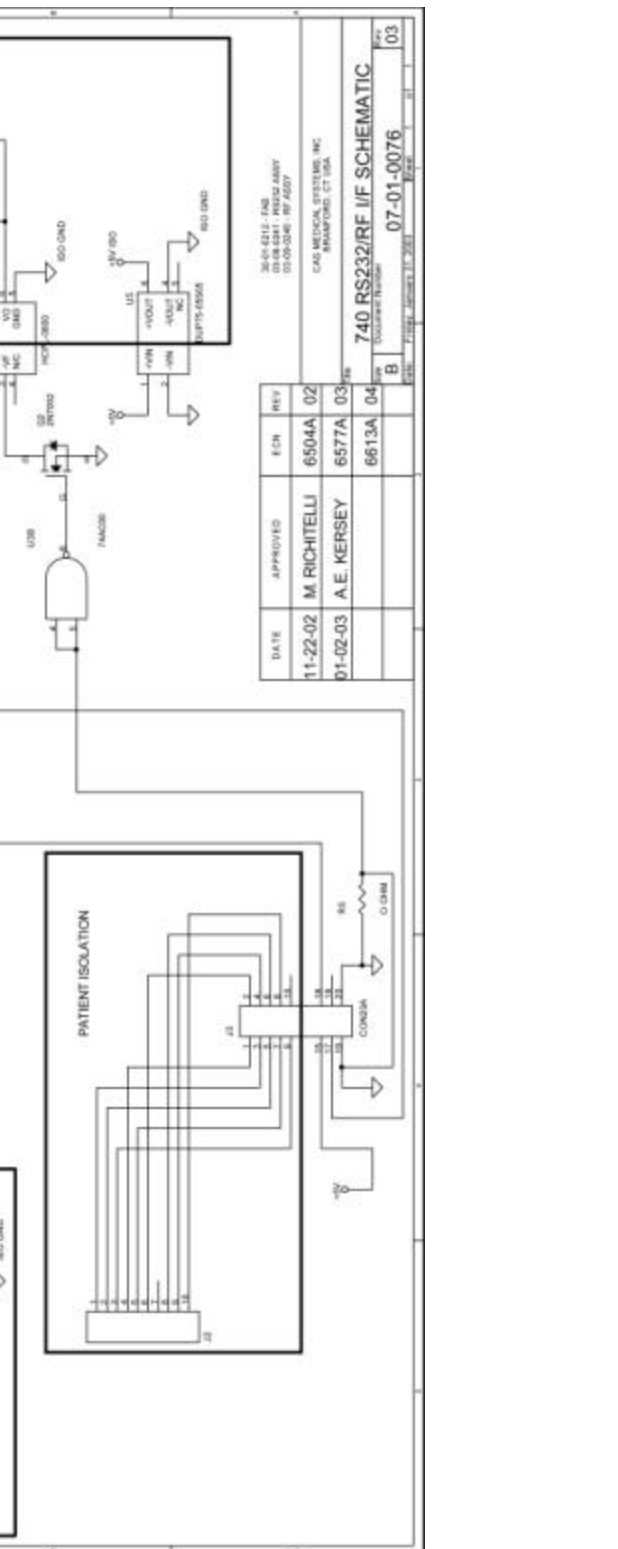
CAS Medical Systems, Inc.			
740 MAIN CONTROL BOARD			
Rev.	Revision Number	Part Number	Rev.
B	07-01-0069	07-01-0069	07
EPA: Washington, April 18, 2001			

TEMPERATURE INTERFACE BOARD

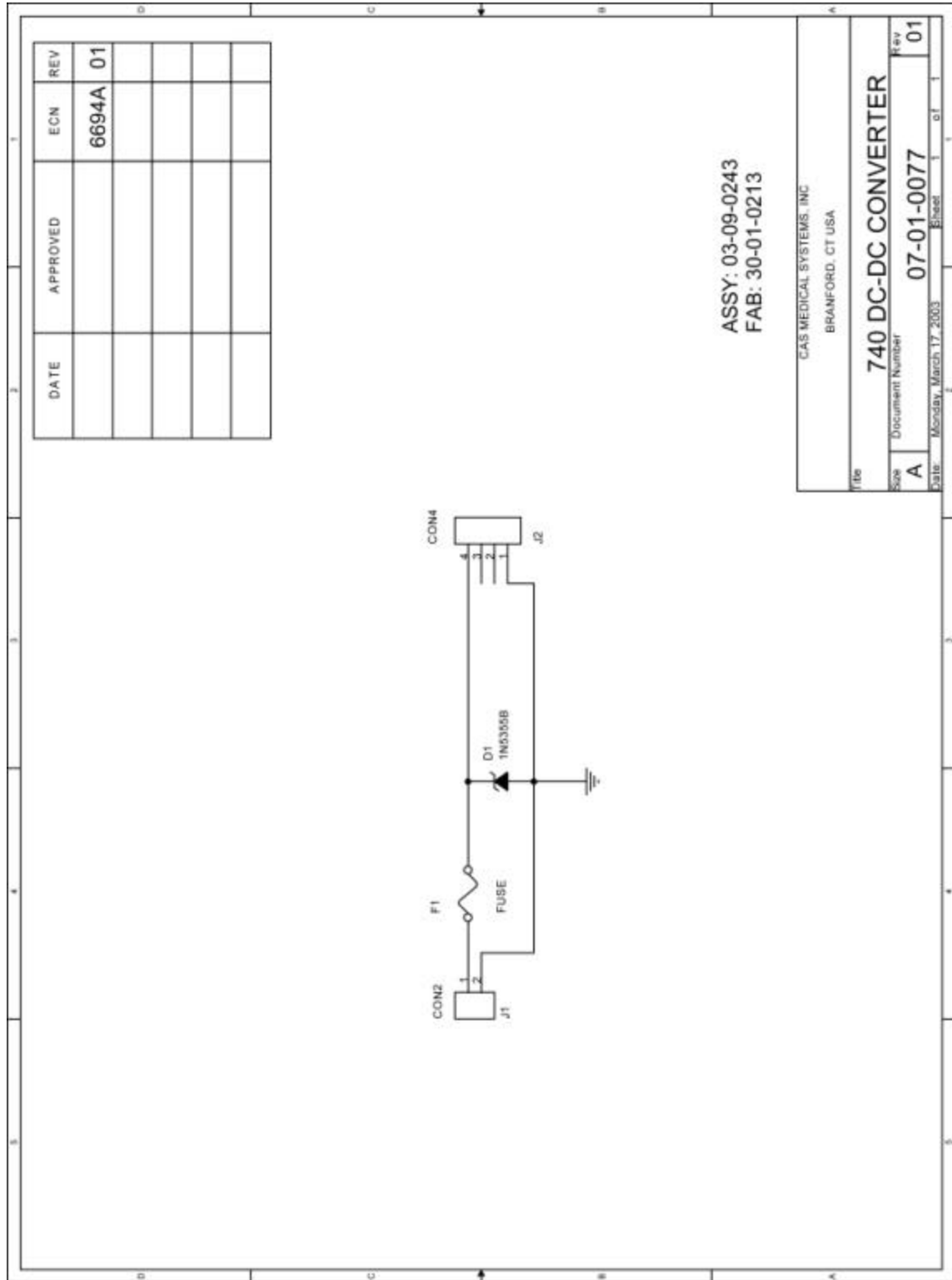


NONIN INTERFACE BOARD





DC CONVERTER BOARD



PROPRIETARY BOARDS

Due to the proprietary nature of the Power Supply Board from Condor, the SpO₂ Boards from Masimo, Nellcor and Nonin, and the Temperature Board from Welch Allyn, the schematics, board layouts and bill of materials could not be placed into this service manual.

Contact Condor, Masimo, Nellcor, Nonin and Welch Allyn directly for this information.

14. SPARE PARTS

PRINTED CIRCUIT BOARDS

<u>Part Number</u>	<u>Description</u>
03-09-0243	DC Input Board – 740M
03-09-0234	Main Control Board
28-02-0419	Masimo SpO ₂ Board
03-08-0435	ND NIBP Module
28-02-0424	Nellcor SpO ₂ Board
28-02-0106	Nonin SpO ₂ Board
11-01-0057	Power Supply Board
03-09-0241	RS232 / Nurse Call Interface Board
28-02-0417	Temperature Board

SWITCHES/CONTROLS/CONNECTORS

<u>Part Number</u>	<u>Description</u>
22-01-0271	AC Input with Filter and Fuse Holder
21-06-0015	Membrane Keypswitch Panel
27-03-0094	NIBP Input Connector

CABLES

<u>Part Number</u>	<u>Description</u>
18-02-0220	Control Board to Battery Harness
18-02-0228	Internal Power Cbl - 740M
18-02-0225	Masimo SpO ₂ Input Cable
18-02-0226	Nellcor to Main Control Board I/F Cable
18-02-0224	Nellcor SpO ₂ Input Cable
18-02-0222	Nonin SpO ₂ Input Cable
18-02-0219	Supply to Main Control Board Harness

MISC PARTS

<u>Part Number</u>	<u>Description</u>
29-01-0296	Battery Cover
23-01-0118	Battery Harness Plate
14-01-0023	Battery Pack, Smart Pack
14-01-0024	Battery Pack, Standard
29-01-0300	Case, CAS 740 Front with SpO ₂ window
29-01-0294	Case, CAS 740 Front without SpO ₂ window
29-01-0295	Case, CAS 740 Rear
29-01-0301	Case, RS232 / Nurse Call Module
29-01-0302	Case, Temperature Module
28-02-0422	Foot Pad
09-01-0002	Fuse, 5x20mm, SLO-BLO, 500 mA
09-01-0008	Fuse, 3.15 Amp, Time-Lag - 740M
28-02-0433	Gasket, Side Module
01-02-0185	Hose, NIBP, 6 FT, Straight (Neonatal and Infant)
01-02-0131	Hose, NIBP, 10 FT, Coiled (Adult and Pediatric)
29-01-0299	IR Window
21-01-1317	Label Set
01-02-0248	Pressure Cylinder, 500 mL
29-01-0298	Sensor Connector Panel, Masimo and Nellcor
29-02-0020	Sensor Connector Panel, Nonin

15. SPECIFICATIONS

NIBP MEASUREMENT

Technique: Oscillometric (MAX NIBP™ Technology)
Microprocessor software eliminates most ambient noise and motion artifact.

Patient Range: Neonate – Adult

Blood Pressure Range	<u>NEO</u>	<u>ADULT</u>
Systolic:	30 – 135 mmHg	30 – 255 mmHg
Diastolic:	15 – 110 mmHg	15 – 220 mmHg
MAP:	20 – 125 mmHg	20 – 235 mmHg

Pulse Rate Range: 40 – 240 BPM 30 – 240 BPM

Accuracy

Blood Pressure: ± 5 mmHg with a standard deviation no greater than 8 mmHg (See Standards)

Pulse Rate: $\pm 2\%$ or ± 2 BPM, whichever is greater

OXIMETRY (OPTIONS)

Masimo SET®

Type: Functional Oxygen Saturation

SpO₂ % Range: 0 - 100%
SpO₂ Accuracy: 70 - 100%, ± 2 digits (1 S.D.) Adult
70 - 100%, ± 3 digits (1 S.D.) Neonate

Measurement Wavelengths: Red 660 Nanometers
Infrared 905 Nanometers

Power: Maximum radiant power at 50 mA pulsed is 0.79mW

Pulse Rate Range: 25 - 240 BPM

Pulse Rate Accuracy: ± 3 BPM

Numerics: Updated every 50 milliseconds max.

Nellcor® OxiMax™

Type: Functional Oxygen Saturation

SpO₂ % Range: 1 - 100%

SpO₂ Accuracy: 70 - 100%, +/-2 digits (1 S.D.) Adult

70 - 100%, +/-3 digits (1 S.D.) Neonate

Measurement Wavelengths: Red 660 Nanometers
Infrared 890 Nanometers

Power: Not exceeding 15 mW

Pulse Rate Range: 20 - 240 BPM

Pulse Rate Accuracy: +/-3 digits

Numerics: Updated every 50 milliseconds max.

Nonin®

Type: Functional Oxygen Saturation

SpO₂ % Range: 0 - 100%

SpO₂ Accuracy: 70 - 100%, +/-2 digits (1 S.D.) Adult

70 - 100%, +/-3 digits (1 S.D.) Neonate

Measurement Wavelengths: Red 660 nanometers
Infrared 910 Nanometers

Power: 3 mW nominal

Pulse Rate Range: 18 - 240 BPM

Pulse Rate Accuracy: +/-3% or +/-1 digit, whichever is greater

Numerics: Updated every 50 milliseconds max.

TEMPERATURE (OPTIONAL)

Temperature Range: 28.9 to 42.2 °C (84.0 to 108.0 °F)

Accuracy: +/-0.1°C (+/-0.2°F), Meets or exceeds ASTM Standards

PATIENT ALARMS

CAS 740
with NIBP

Patient Parameter	Neonatal Limit Range		Adult Limit Range	
	Low	High	Low	High
SYS	35 – 130	35 – 130	35 – 250	35 – 250
DIA	20 – 105	20 – 105	20 – 215	20 – 215
MAP	25 – 120	25 – 120	25 – 230	25 – 230
Pulse	45 – 235	45 – 235	35 – 235	35 – 235

CAS 740
with NIBP
and SpO₂

Patient Parameter	Neonatal Limit Range		Adult Limit Range	
	Low	High	Low	High
SYS	35 – 130	35 – 130	35 – 250	35 – 250
DIA	20 – 105	20 – 105	20 – 215	20 – 215
MAP	25 – 120	25 – 120	25 – 230	25 – 230
%SpO ₂	70 – 95	80 – 99	70 – 95	80 – 99
Pulse	25 – 235	25 – 235	25 – 235	25 – 235

NOTE:

Each alarm limit may also be selected “OFF” individually or as a whole.
 Low Limits cannot be set above the associated High Limit.
 High Limits cannot be set lower than the associated Low Limit.

CONTROL PANEL

Display: LED display of measurement results, instructions, troubleshooting messages and signal strength bar.

Parameters Displayed: Systolic Pressure, Diastolic Pressure and Mean Arterial Pressure (MAP)
 Pulse Rate
 %SpO₂
 Temperature (in Fahrenheit or Celsius)

OPERATING MODES

Patient: NIBP function in Neonatal or Adult

NIBP: Manual, STAT or Automatic (at preset intervals)

History: Review of previous measurements

%SpO₂: Continuous Monitoring

Temperature: Predictive or Continuous Monitoring

POWER

Source:	External line or internal battery
AC Power:	100 - 240 VAC, 50/60 Hz, 0.5A; Fuse Rating – T500mAL250V (two provided)
DC Power (EMS Option):	+12 VDC; 7W; Fuse Rating – Wickman Type TE5, Time Lag, 3.15A, 125VAC or approved equivalent (one provided)
Battery:	Smart Nickel Metal Hydride (NiMH) battery pack (user removable) Charge Time: 4 hours Operation on battery: 100 NIBP readings when set in the 5-minute Automatic Mode
Leakage Current:	100 microamp (maximum)

FEATURES

Self Test:	System self test is performed each time power is turned on.
Auto Zero:	Zero pressure reference is automatically established after every reading.
Inflation:	Initial inflation to 150 mmHg (Adult) or 100 mmHg (Neonatal) or user selectable. (100, 120, 140, 160, 180, 200) - Adult ; (60, 80, 100, 120) - Neonatal. Subsequent inflation to approximately 30 mmHg greater than previous Systolic pressure.
Deflation:	Automatic
Max Measurement Time:	Limited to 120 seconds (Adult), 90 seconds (Neonate)

SAFETY LIMITS

Automatic Cuff Deflation:	If cuff pressure exceeds 290 mmHg (Adult); 145 mmHg (Neonate) If measurement time exceeds 120 seconds (Adult), 90 seconds (Neonate) If safety timer detects microprocessor failure
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OPERATING ENVIRONMENT

Operating Temperature: 0°C to 50°C (32°F to 122°F) – for NIBP & SpO₂
16°C to 40°C (61°F to 104°F) – for Temperature

Humidity: 15 - 95%, non-condensing

Altitude / Barometric: -152.4 m to +3048 m (-500 ft. to +10,000 ft.)
Pressure: +1032 hPa to +697 hPa (+774.1 mmHg to +522.8 mmHg)

Storage / Transport
Temperature: -20°C to 65°C (-4°F to 149°F)

Humidity: 15 - 95%, non-condensing

Altitude / Barometric: -152.4 m to +3048 m (-500 ft. to +10,000 ft.)
Pressure: +1032 hPa to +697 hPa (+774.1 mmHg to +522.8 mmHg)

Monitors may not meet performance specifications if stored or used outside temperature and humidity ranges. When moving the monitor from a storage location, wait at least one-hour prior to use to allow the monitor to adjust to room temperature.

PHYSICAL DIMENSIONS & WEIGHT

Base Unit
H x W x D: 6.75 in x 8.5 in x 3.0 in
(17 cm x 21.5 cm x 7.5 cm)

Weight: 3 lbs approx. (1.4 kg)

OPTIONAL ACCESSORIES

Infrared Printer
Swiveled Hard Mount (for ambulance applications)
Roll Stand and Basket
Protective Carrying Case

SERIAL INTERFACE

Speed: 9600
Interface: Bidirectional serial communication
Signal Level: RS232C
Data Length: 8 bits
Start Bit: 1 bit
Stop Bit: 1 bit
Parity: None

STANDARDS

Accuracy complies with that given in American National Standard for Electronic or Automated Sphygmomanometers, ANSI/AAMI SP10, 1992. Adult blood pressure measurements determined with this device are equivalent to those obtained by an auscultatory blood pressure measurement device and neonatal ones are equivalent to those obtained by an intra-arterial blood pressure device, within the limits prescribed by the American National Standard for Electronic or Automated Sphygmomanometers. The 4th Korotkoff sound was used to determine Diastolic pressure. Study findings are available.

Units comply with the following requirements:

- EN 60601-1
- EN 60601-1-2
- EN 865
- EN 60601-2-30
- EN 60601-2-49
- ETL Listed - UL 2601, CAN/CSA C22.2 No.601.1
- CE marking according to Directive 93/42/EEC

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Possession or purchase of this device does not convey any express or implied license to use the device with replacement parts which would, alone, or in combination with this device, fall within the scope of one or more of the patents relating to this device.

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NONIN[®], NONIN[®] Finger Clip Sensor and Flexi-Form Sensors are registered trademarks of Nonin Medical, Inc.

SureTemp[™] Temperature Probe is a trademark of Welch Allyn, Inc.

MAXNIBP[™] is a trademark of CAS Medical Systems, Inc.



is a registered trademark of CAS Medical Systems, Inc. All units covered by U.S. patent 4,796,184 and 5,022,403. Other patents pending.

Monitors are  marked.